OKI

MICROLINE 320FB Printer

Maintenance Manual

All specifications are subject to change without notice.

PREFACE

This maintenance manual describes field maintenance of the Microline 320FB printer and options for maintenance personnel.

For performance specifications and operating procedures, refer to the "User's Manual".

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1. CONFIGURATION

1. CONFIGURATION

1.1 Standard Printer Configuration

The standard configuration of the ML320FB is shown below.

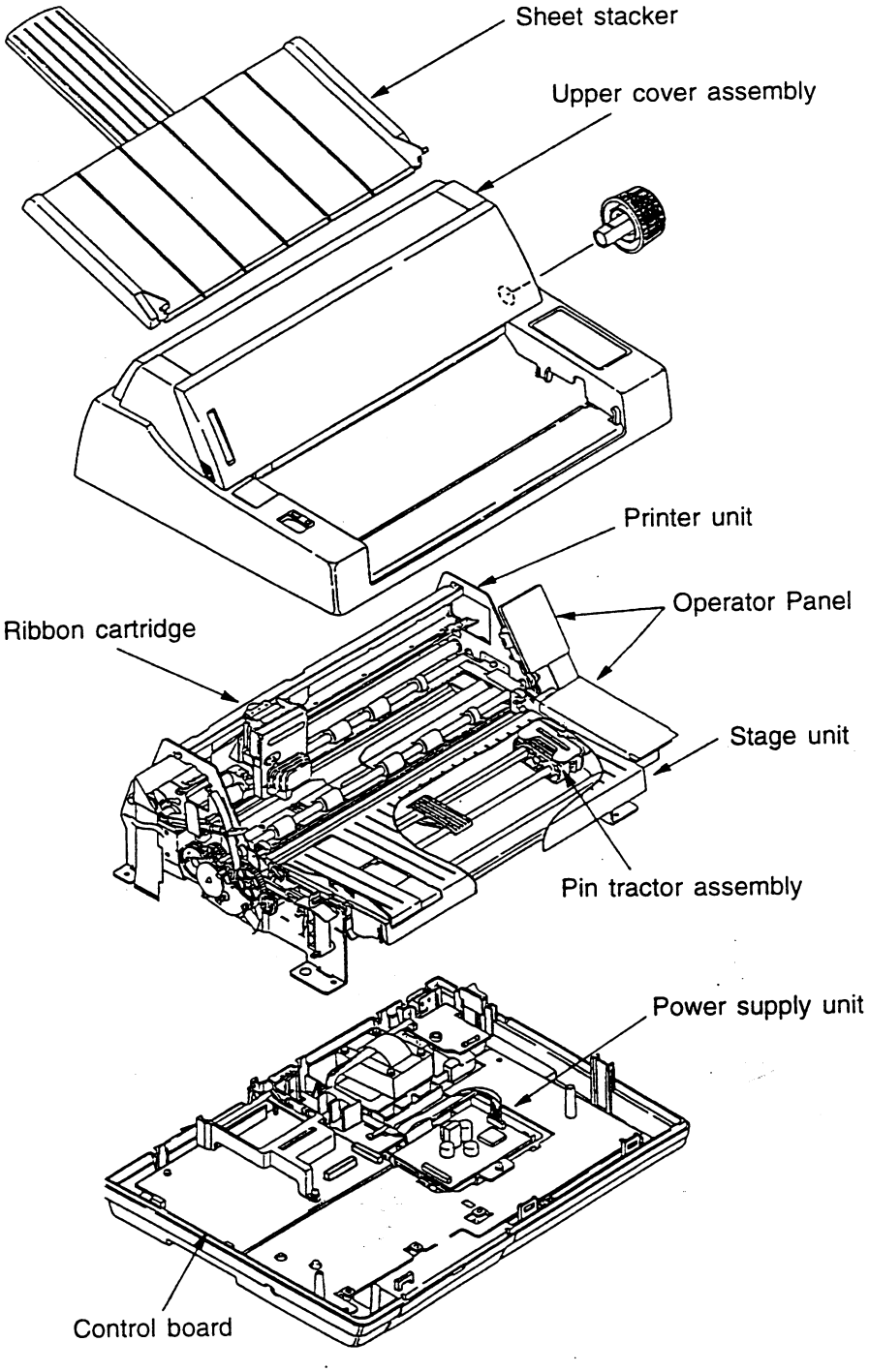
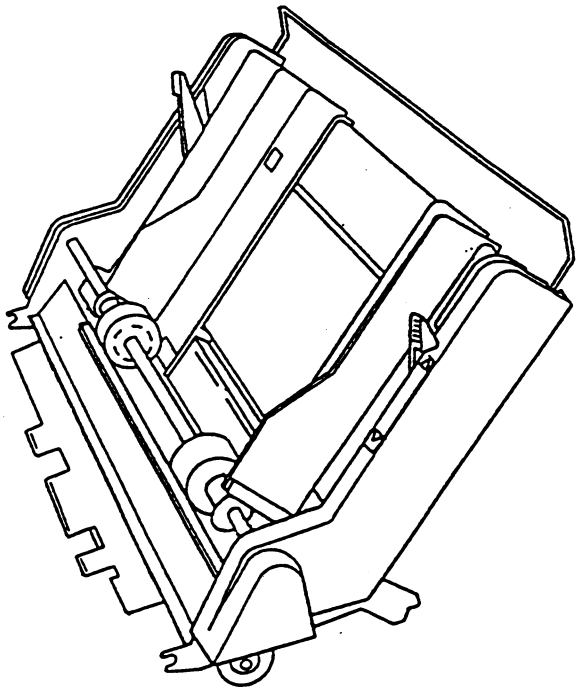


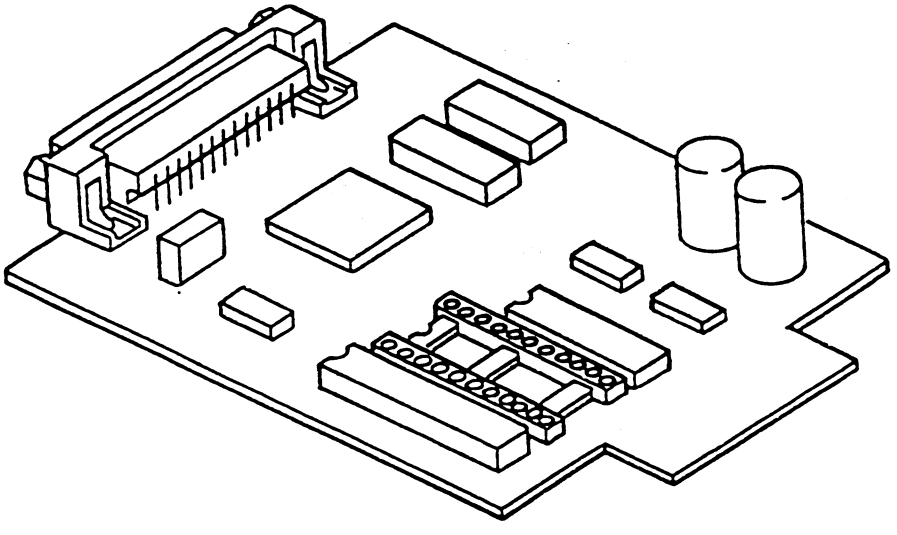
Figure 1-1 Printer configuration

1.2 Options

(1) Cut-sheet feeder unit



(2) Super-speed RS-232C serial interface board



1.3 Specifications

1.3.1 Print specifications

(1) Printing method : Impact dot matrix

(2) Number of dot wires : 9

(3) Dot wire diameter : 0.013 inch (0.34 mm)

(4) Printing direction : Bidirectional, short-line-seeking printing
Undirectional printing specifiable

(5) Printing speed :

Print mode	Character pitch				
	10 CPI	12 CPI	15 CPI	17.1 CPI	20 CPI
Utility	250 CPS	250 CPS	250 CPS	250 CPS	250 CPS
NLQ	62.5 CPS	62.5 CPS	62.5 CPS	62.5 CPS	62.5 CPS
HSD*	300 CPS	360 CPS	300 CPS	300 CPS	300 CPS

* High Speed Draft

(6) Character sets

Standard ASCII

IBM All Character Sets (IBM mode)

IBM Character Set I & II (IBM mode)

Italic Character Sets (EPSON mode)

Graphics Character Sets (EPSON mode)

International Character Sets

(7) Character pitches

The following character pitches are selectable through the operator panel* or with control codes:

5 CPI 0.2 inch (5.08 mm)
6 CPI 0.167 inch (4.23 mm)
7.5 CPI 0.133 inch (3.39 mm)
8.5 CPI 0.117 inch (2.96 mm)
* 10 CPI 0.1 inch (2.54 mm)
* 12 CPI 0.083 inch (2.12 mm)
* 15 CPI 0.067 inch (1.69 mm)
* 17.1 CPI 0.058 inch (1.48 mm)
* 20 CPI 0.05 inch (1.27 mm)

1.3.2 Paper specifications

(1) Cut-Sheet Paper

Paper Width	90 mm to 304.8 mm (3.5" to 12")
Paper Length	70 mm to 420 mm (2.75" to 16.5")
Single part	
Weight	12 to 41 lb.
Thickness	0.057 mm to 0.196 mm (0.0022" to 0.0077")
Multipart	
Weight	Paper: 10 to 12 lb. Carbon: 9 lb.
Number of copies	Original plus 4 copies
Thickness	0.356 mm max. (0.014" max.)

* Note: All parts must be glued at the top.

(2) Continuous Paper

Paper Width	76.2 mm to 304.8 mm (3" to 12")
Paper Length	76.2 mm to 355.6 mm (3" to 14")
Single part	
Weight	12 to 34 lb.
Thickness	0.057 mm to 0.16 mm (0.0022" to 0.0063")
Multipart-carbon lined or pressure sensitive	
Weight	9 to 11 lb.
Number of copies	Original plus 4 copies
Thickness	0.356 mm max. (0.014" max.)
Multipart-interleaf	
Weight	Paper: 10 to 12 lb. Carbon: 9 lb.
Number of copies	Original plus 4 copies
Thickness	0.356 mm max. (0.014" max.)

* Note: Multiple-part paper should be fastened by spot-pasting or crimping on both sides, and should be free of wrinkles.

(3) Cut Form Envelope (individual)

Weight	24 lb. max.	
Thickness	0.406 mm	(0.016" max)
Dimensions	165 mm x 92 mm	(6-1/2" x 3-5/8")
	225.4 mm x 98.4 mm	(8-7/8" x 3-7/8")
	241.3 mm x 104.8 mm	(9-1/2" x 4-1/8")

* Note: Friction paper feed only

(4) Card Stock

Weight	50 lb. max	
Thickness	0.24 mm	(0.009" max)
Dimensions	127 mm x 203 mm max	(5" x 8" max.)

* Notes: Do not use fabric labels.
Friction paper feed only

(5) Labels

Carrier	208.3 mm max. (8-1/5" max.) width
Thickness	0.28 mm max. (0.011" max.)

(6) Transparencies

Thickness	0.25 mm max. (0.010" max.)
Dimensions	208.3 mm (8-1/5") W x 279.4 mm (11") L

(7) Cut-Sheet Paper for Cut Sheet Feeder

Length	7.2 to 14.3 inches (182 to 364 mm).
Width	7.2 to 11.7 inches (182 to 297 mm) for Cut-Sheet Feeder.
Ream weight	14 to 24 lb. (52 to 90 g/m^2)
Smoothness	75 to 300 (Sheffield).

1.3.3 Physical specifications

(1) External dimensions

18.3 inches (465 mm) (W) x 7.87 inches (200 mm) (H) x 13.5 inches (343 mm) (D)
These dimensions do not include platen knob and sheet stacker.

(2) Weight

26.5 lbs (12 kg)

1.3.4 Power requirements

(1) Input power

Single-phase AC
Voltage : 230/240 VAC + 10% - 10%
Frequency : 50/60 Hz ± 2%

(2) Power consumption

Operating : 70 VA
Idle : 25 VA

1.3.5 Environmental conditions

(1) Ambient temperature and relative humidity

a. Printer

	Operating	Non-operating	Storage	Unit
Temperature	41 to 104 (5 to 40)	14 to 109.4 (–10 to 43)	–40 to 158 (–40 to 70)	°F (°C)
Relative Humidity	20 to 90	5 to 95	5 to 95	% RH

b. Cut sheet Feeder

	Operating	Non-operating	Storage	Unit
Temperature	50 to 95 (10 to 35)	14 to 109.4 (–10 to 43)	–40 to 158 (–40 to 70)	°F (°C)
Relative Humidity	40 to 80	5 to 95	5 to 95	% RH

The printer must be packed during storage.
Avoid condensation at all times.

(2) Vibration

Operating : 0.3G (5 to 150 Hz) or less (except when the unit is producing resonant frequency)
Non-operating : 1G (5 to 150 Hz) or less (except when the unit is producing resonant frequency)
Packed : 3G (5 to 150 Hz) or less (except when the unit is producing resonant frequency)

(3) Impact (Drop test)

Packing : 30" (One corner and three edges and all six sides)

1.3.6 Noise

(1) Measuring method

Place the printer 2.46 feet (0.75 m) above the floor. Place the microphone 4.92 ft (1.5 m) above the floor and 3.28 ft (1 m) in front of the printer.

(2) Printing

The pattern (40 characters per line) conforming to the ECMA standard shown below is printed on cutsheet papers of 15 lbs/m² (57 g/m²).

J1YY7 2DA90 8S8=2 6A180 B31AJ 5FT0E PG1TK X6D-4
␣ ␣ ␣ ␣ ␣ ␣ ␣

␣: indicates a space of 5 characters.

(3) Measurement
59.5 dB or less (in the UTL mode)

1.3.7 Agency approvals

VDE : VDE 0805.
VDE 0871 Class B.
BS : BS 7002

2. INSTALLATION PROCEDURE

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2.1 Unpacking

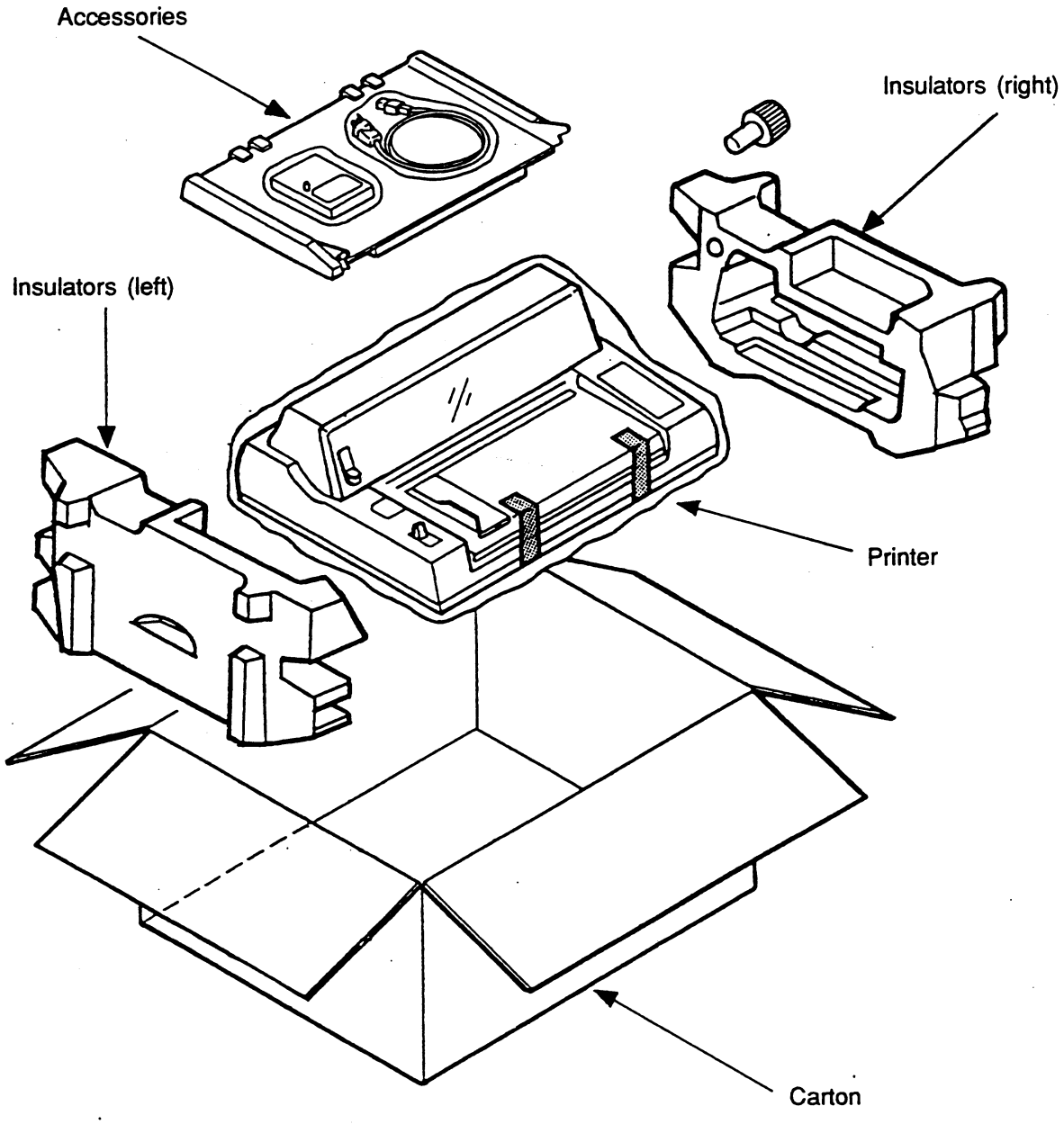
2.1.1 Unpacking the carton

(1) Open the carton.

(2) Take out the accessories.

(3) Take out the printer unit together with insulators.

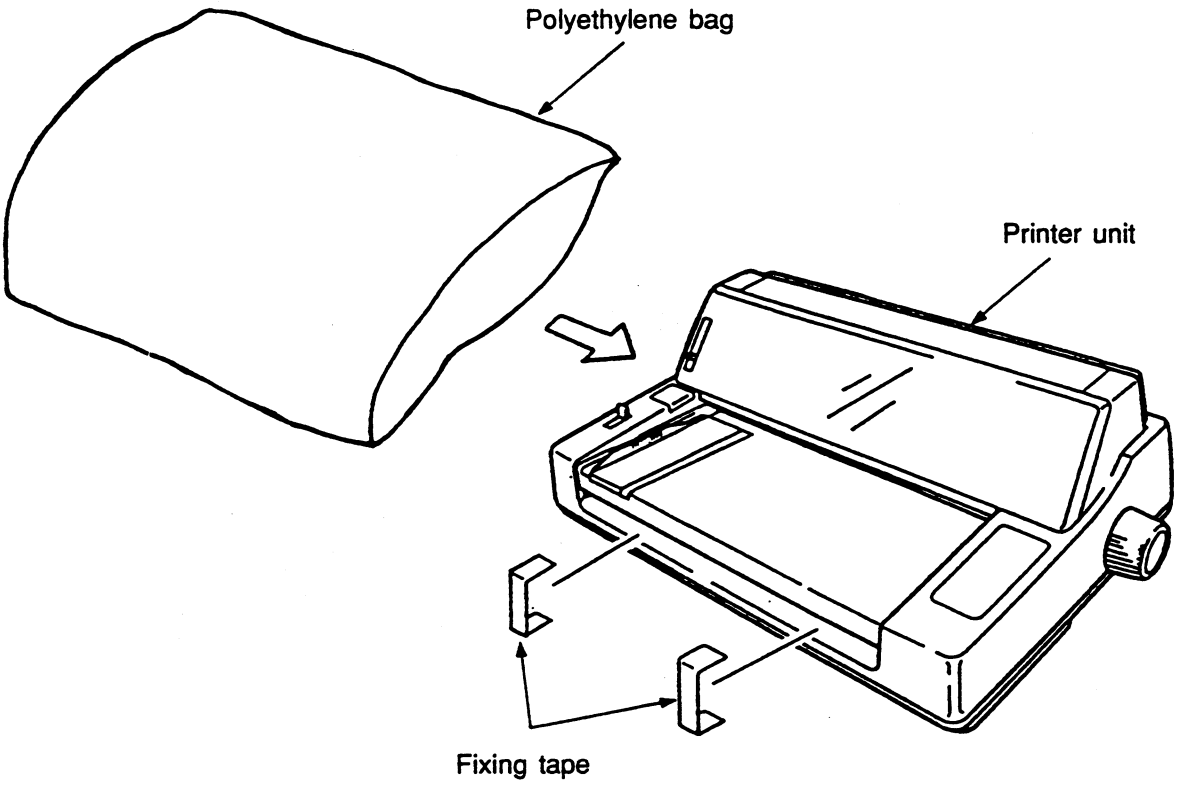
(4) Remove the insulators (left and right) from the printer.



2.1.2 Unpacking the printer unit

(1) Remove the printer unit from the polyethylene bag.

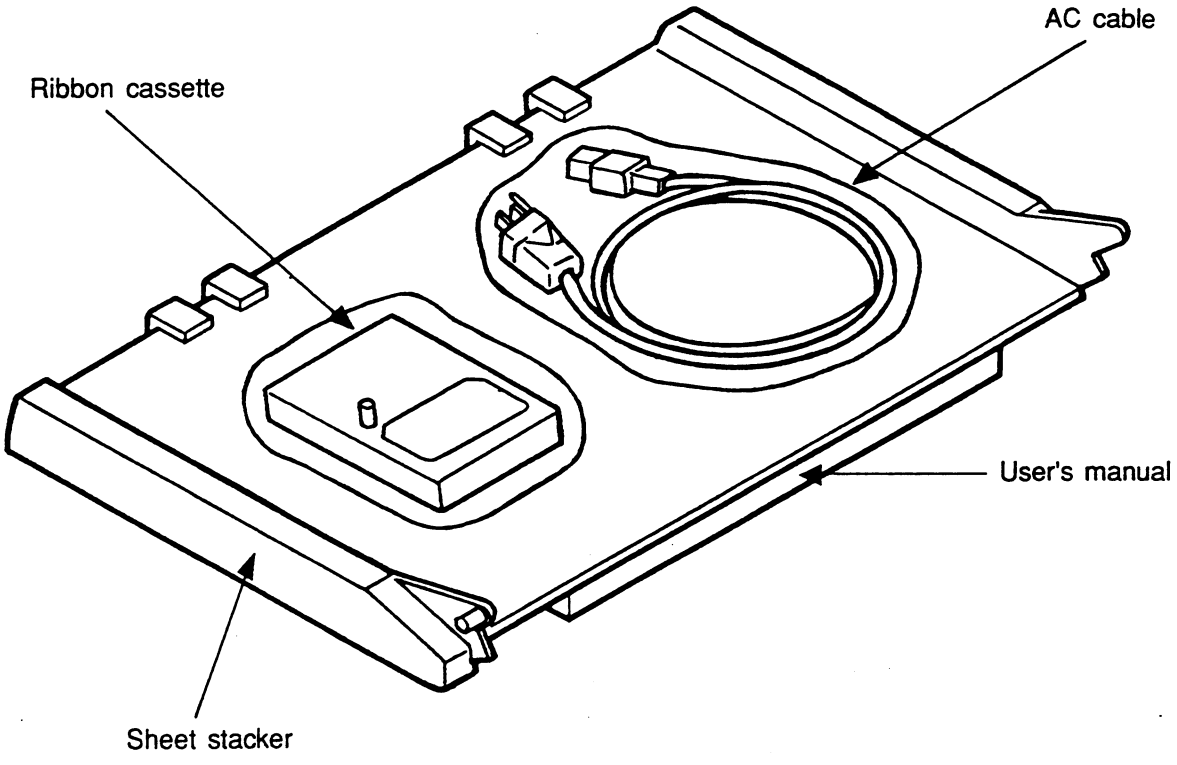
(2) Remove the tapes.



2.1.3 Unpacking the accessories

(1) Remove the shrink-wrap sheet.

(2) Take out the AC cable, ribbon cassette, sheet stacker, and user's manual.



2.2 Installation (refer to the User's Manual for details.)

2.2.1 Precautions for installation

Pay attention to the following when installing the printer:

(1) Do not install the printer in the following places:

(a) Any place exposed to direct sunlight.

(b) Any place with great fluctuations in temperature.

(c) Any place exposed to outdoor wind.

(d) A dusty place.

(e) Near a door.

(f) Near an air-conditioner.

(g) Any place with heavy vibrations.

(2) Adjust the temperature and humidity of the installation site as follows:

Temperature : 41 to 104°F (5 to 40°C)
Humidity : 20 to 90% RH

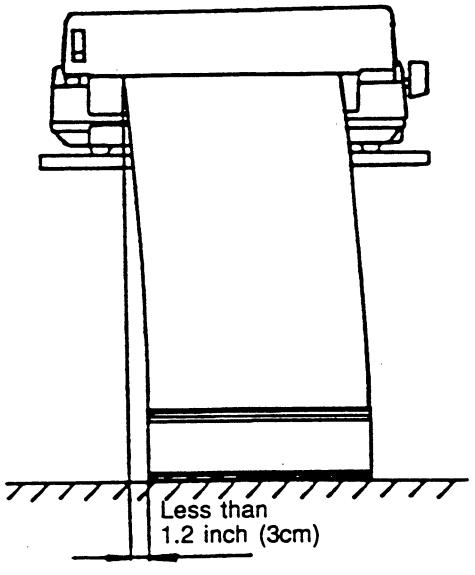
(3) Place the printer and continuous form in the following manner:

1) The height of the desk for the printer is 29.5 inches (75 cm) standard.

(Install the printer on a level and flat desk or standard so that its four rubber feet sit flatly on the surface.)

2) Paper positioning

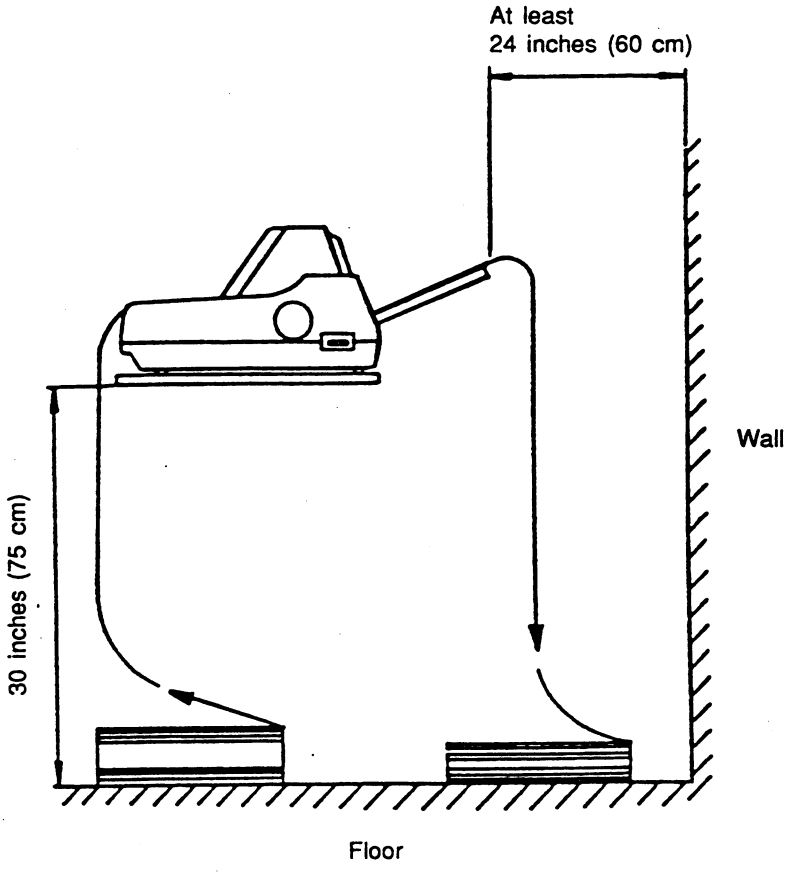
Place forms in parallel with the paper feed path.
The positioning tolerance of the left and right direction should be less than 1.2 inch (3 cm).



3) Printer rear space requirement

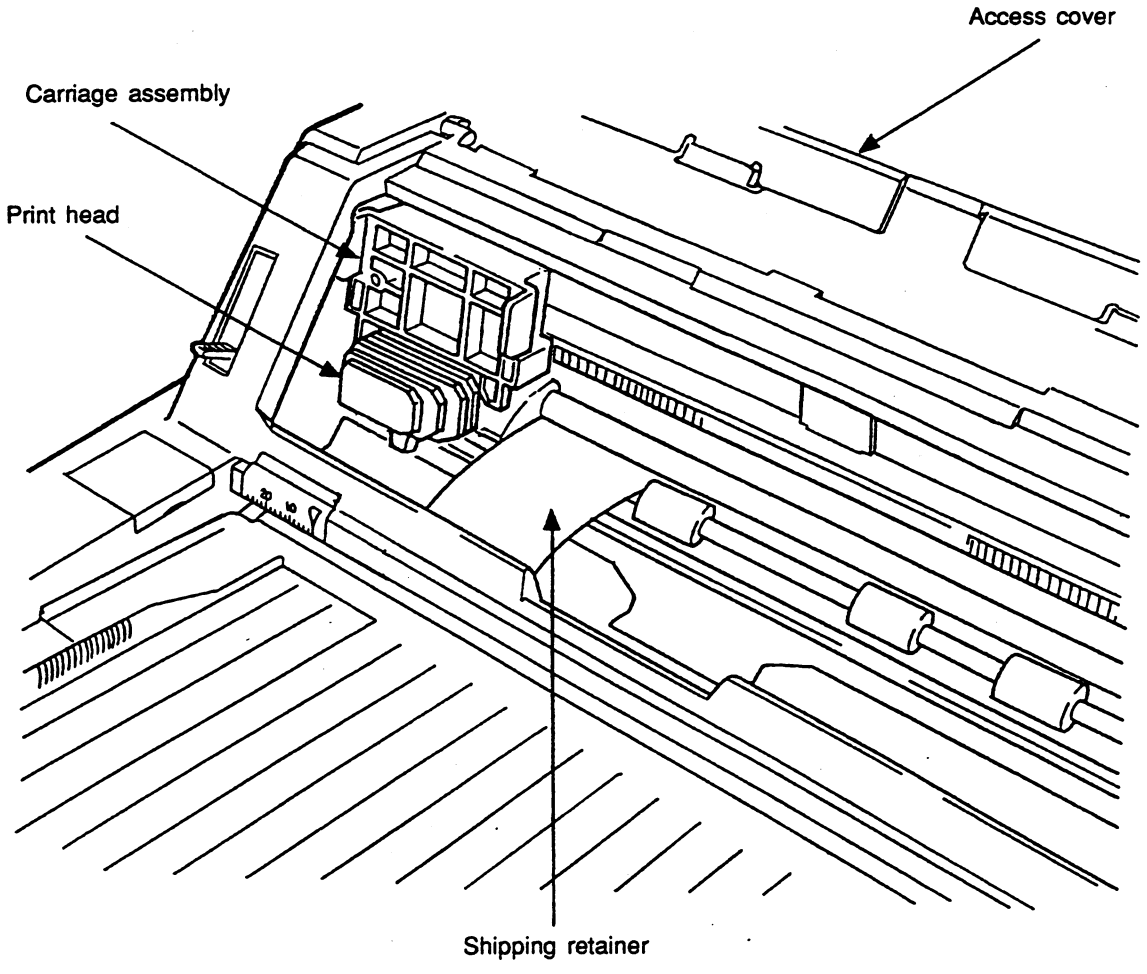
Match the rear part of the printer with the edge of the desk.
Leave more than 24 inches (60 cm) of space behind the printer to allow sufficient room for paper.

4) Sprocket papers, incoming and outgoing forms, must be set in the following manner:



2.2.2 Removing the shipping retainer

Remove the shipping retainer which secures the print head in position during shipping, by opening the access cover.



2.2.3 Installing the accessories

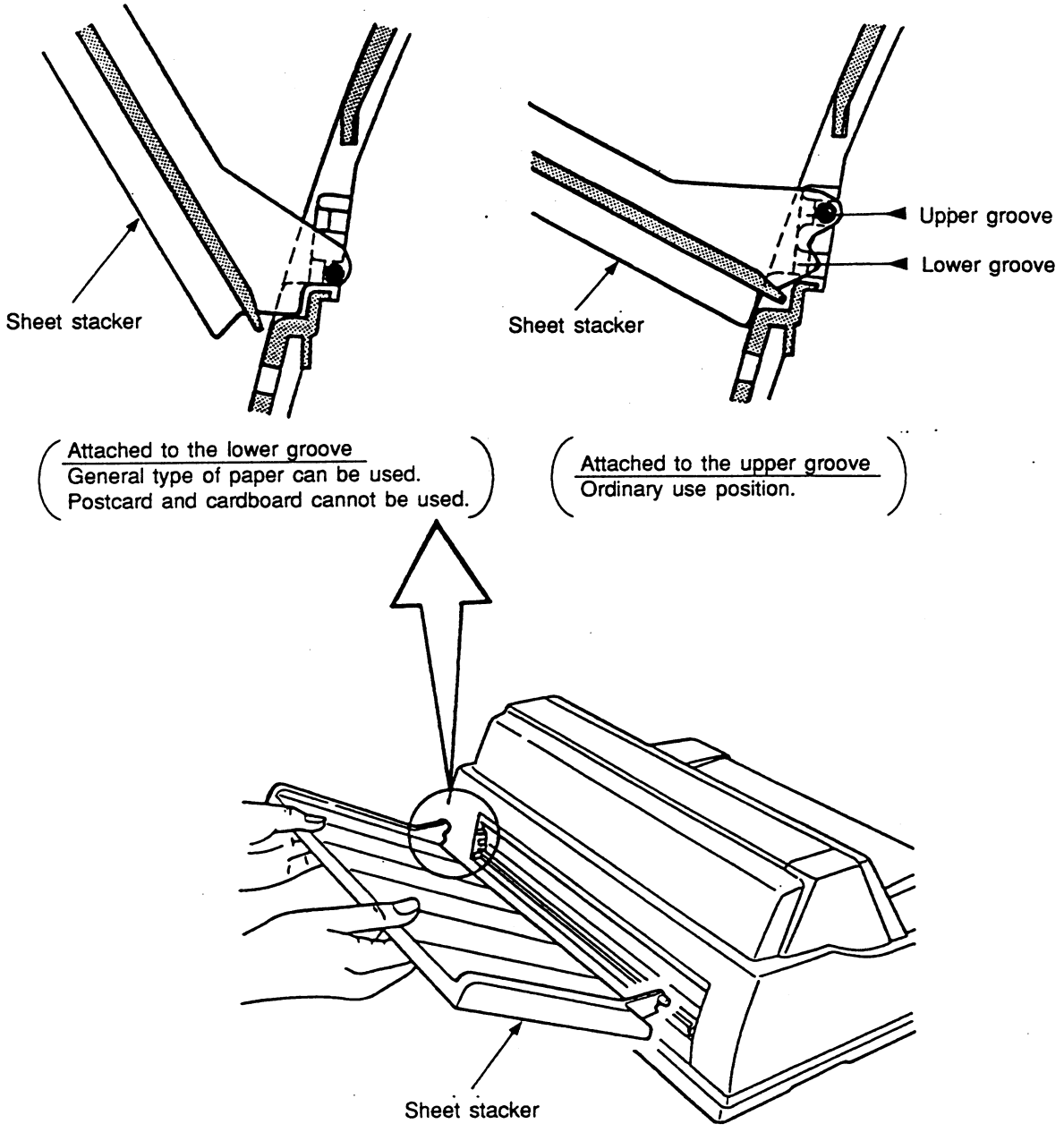
(1) Mounting the sheet stacker

- Cautions for mounting

  The sheet stacker has two grooves, upper and lower. The slanting angles of the sheet stackers vary according to the grooves used for mounting.

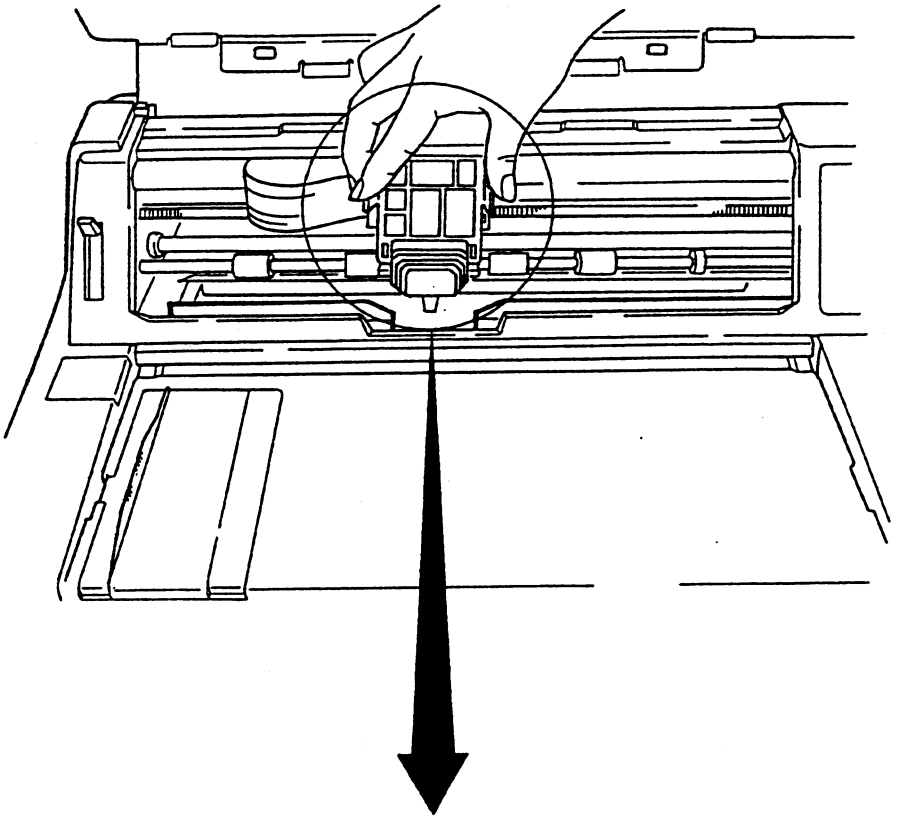
- Mounting

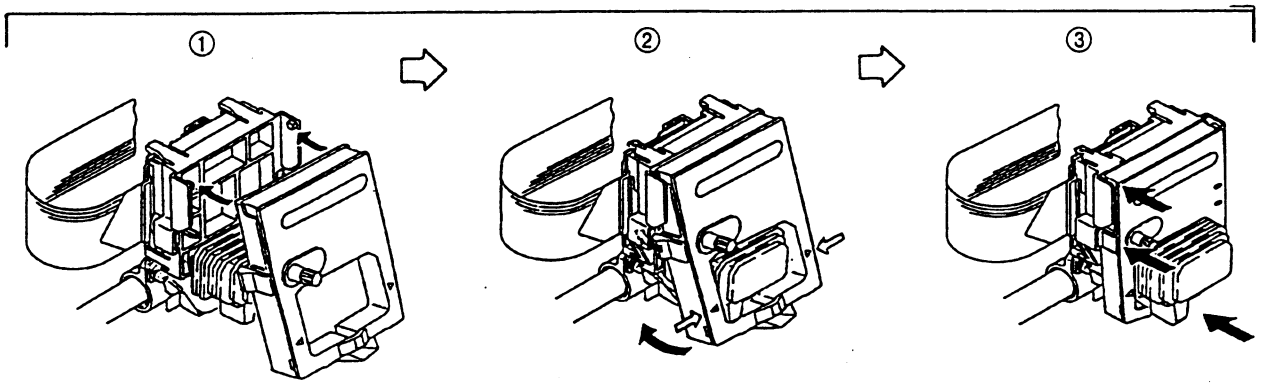
  Insert the legs of the sheet stacker into the upper cover grooves on the rear printer unit. Push the sheet stacker down.



(2) Mounting the ribbon cassette

(a) Set the paper release lever to the cutsheet position indicated by " ▭ ".
(b) Adjust the lever to the R position.
(c) Open the access cover.
(d) Move the carriage assembly to the center of the notch.
(e) Mount the ribbon cassette.

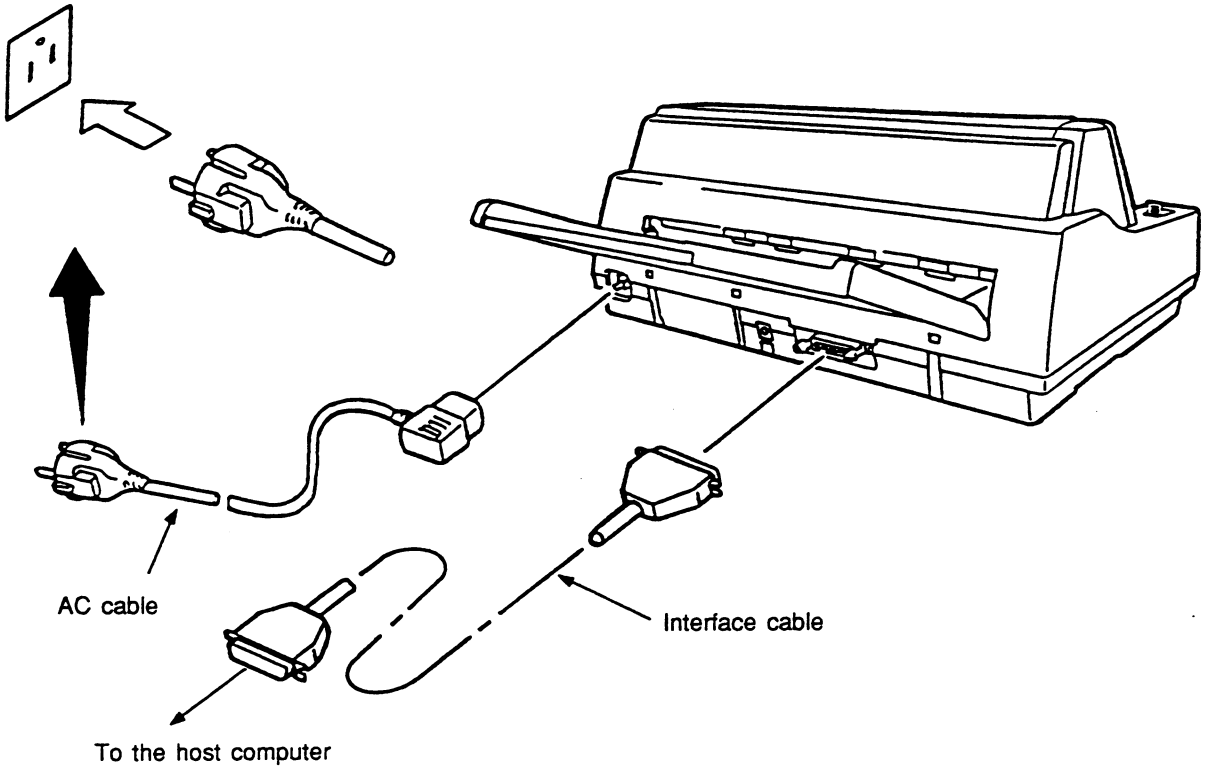




2.2.4 Connecting cables

(1) Connect the interface cable.

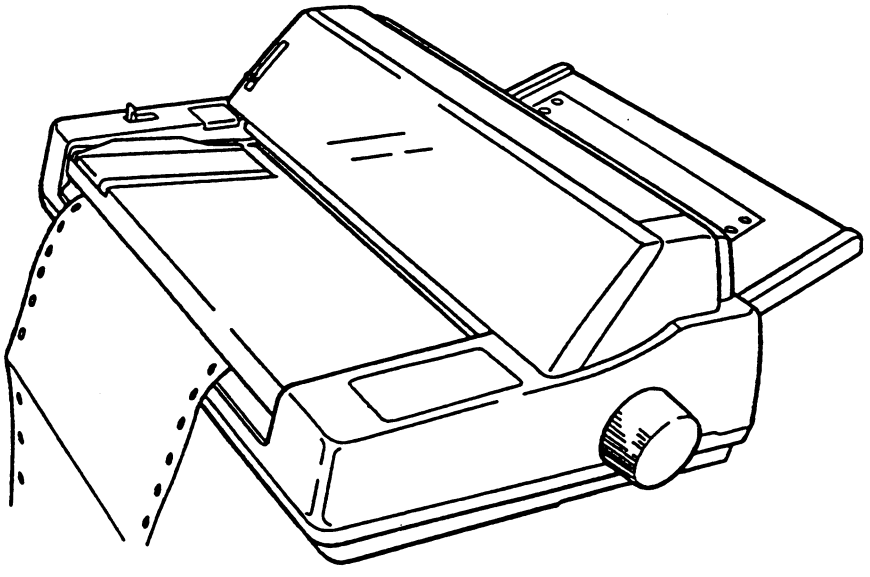
(2) Connect the AC cable.
Make sure that the POWER switch on the right side of the printer is set to OFF side (the side marked with ○).



2.2.5 Installing paper

Install continuous form paper to test the unit (refer to User's Manual for details).

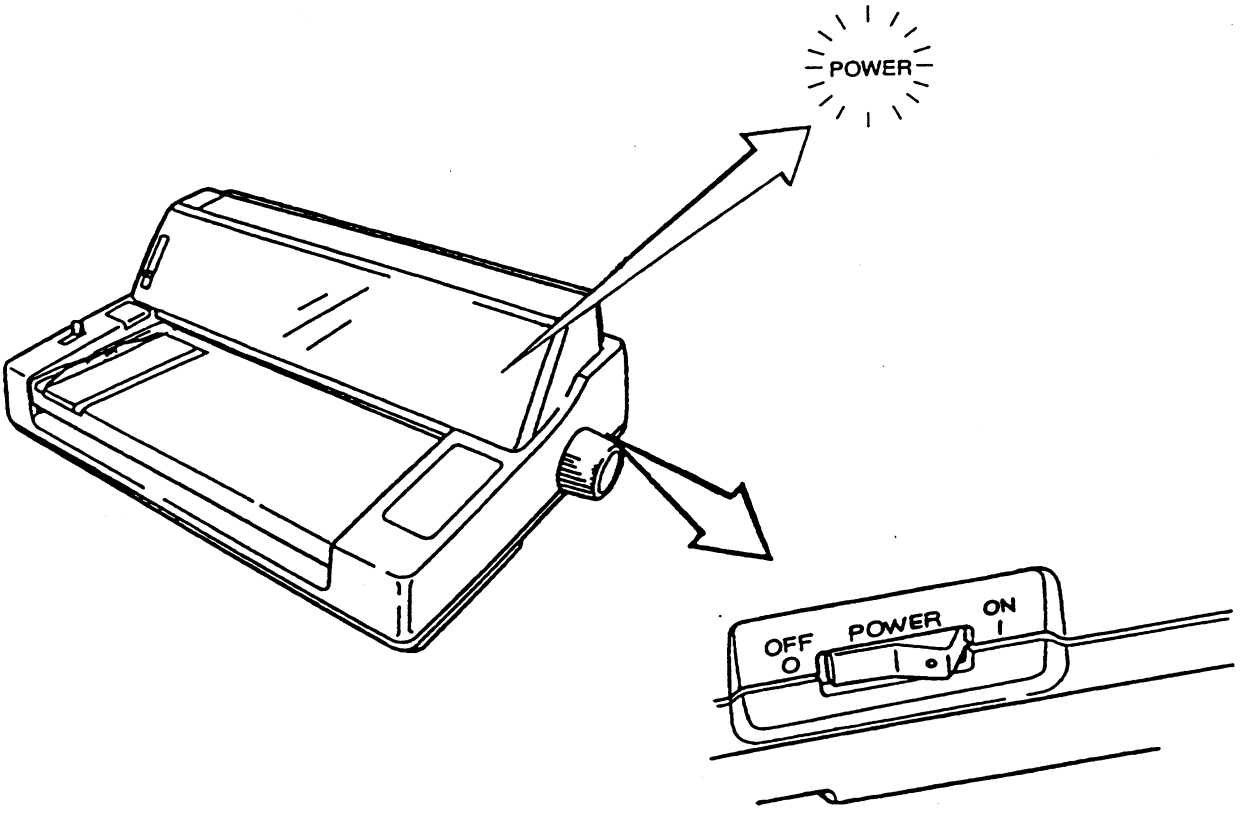
[Note] *When using continuous forms, set stacker support B into the sheet stacker.*



2.2.6 Powering on

(1) Push the POWER switch on the right side of the printer to ON (the side marked with I).

(2) Confirm that the POWER lamp goes on and the printhead returns to its home position.



2.2.7 Rolling ASCII test pattern

(1) Confirm that the POWER switch is OFF and while pressing the TOF/QUIET switch, press the POWER switch to ON.

(2) The rolling ASCII pattern as shown below will be printed.

(3) To finish the test, press the MODE switch.

(4) The SEL lamp will go on, indicating that the printer unit is ready to receive printing data from the host computer.

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
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456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%
```

3. THEORY OF OPERATION

3. THEORY OF OPERATION

3.1 Electrical Operation

This section describes the electrical operation of the printer circuits.

3.1.1 General

The block diagram of the printer circuit is shown in Figure 3-1.
The control board consists of a microprocessor and its peripheral circuits, the drive circuits, sensor and switch detection circuits and interface connectors.

The power to the control board is provided from the power supply board via a connector cord. The power to all other electrical components is distributed via the connectors in the control board.

3.1.2 Microprocessor and its peripherals circuits.

(1) Microprocessor (05D: 80C154)

The microprocessor is the nucleus of the control circuit. Its peripheral circuits operate under the program control of this microprocessor. The I/O ports of the microprocessor are connected to the address bus, data bus, and control lines.

(2) Program ROM (03B)

The program ROM contains the control program of the printer. The microprocessor operates the printer by executing this control program.

(3) RAM (04C and 04D)

The RAM stores data such as received print data.

(4) LSI (MSM7U042) (04B)

The MSM7U042 is an external interface and motor control LSI. It has following functions:

A: External interface controller

(a) Parallel interface function

IFD1 to IFD8 are used as an input port; the parallel data received through the interface connector is latched in synchronization with the strobe signal ($\overline{STB}$) and is sent to the microprocessor in synchronization with the RD signal. The MSM7U042 also sends $\overline{BUSY}$, ACK, $\overline{PE}$ and $\overline{SELECT}$ signals to the parallel interface connector in synchronization with the $\overline{WR}$ signal.

B: Motor controller

(b) Spacing speed control function

This function accelerates and decelerates the spacing motor rotation rate in accordance with the commands received from the microprocessor, and controls the spacing motor speed in each printing mode.

(c) Dot timing generation function

This function generates the dot-on timing signal (IPT), synchronized with the printing speed in accordance with the output signals (PHASE A, B) of the encoder disk on the spacing motor, and sends this timing information to the microprocessor.

C: D-RAM controller

(d) Executes refresh and read/write of D-RAM (04C, 04D) by $\overline{RAS}$, $\overline{CAS}$, and DRAM A0 through A7 signals.

D: Other functions

(e) I/O ports

The MSM7U042 has a 11-bit output port and a 10-bit input port. It sends control signals in accordance with the commands received from the microprocessor.
The input port is also used to read information from the operation panel switches, etc.

(f) Address latch

The address latch latches the low-order 8 bits of the address bus (A0 to A7). These bits are used as an address for read/write operations with peripheral devices. Latching of A0 to A7 is necessary because these 8 bits are also used as the data bus.

(5) CGROM (02B)

The resident character fonts are stored in the character generator.

(6) EEPROM (05B)

This 1k-bit serial data electrically erasable and programmable ROM stores the menu mode data.

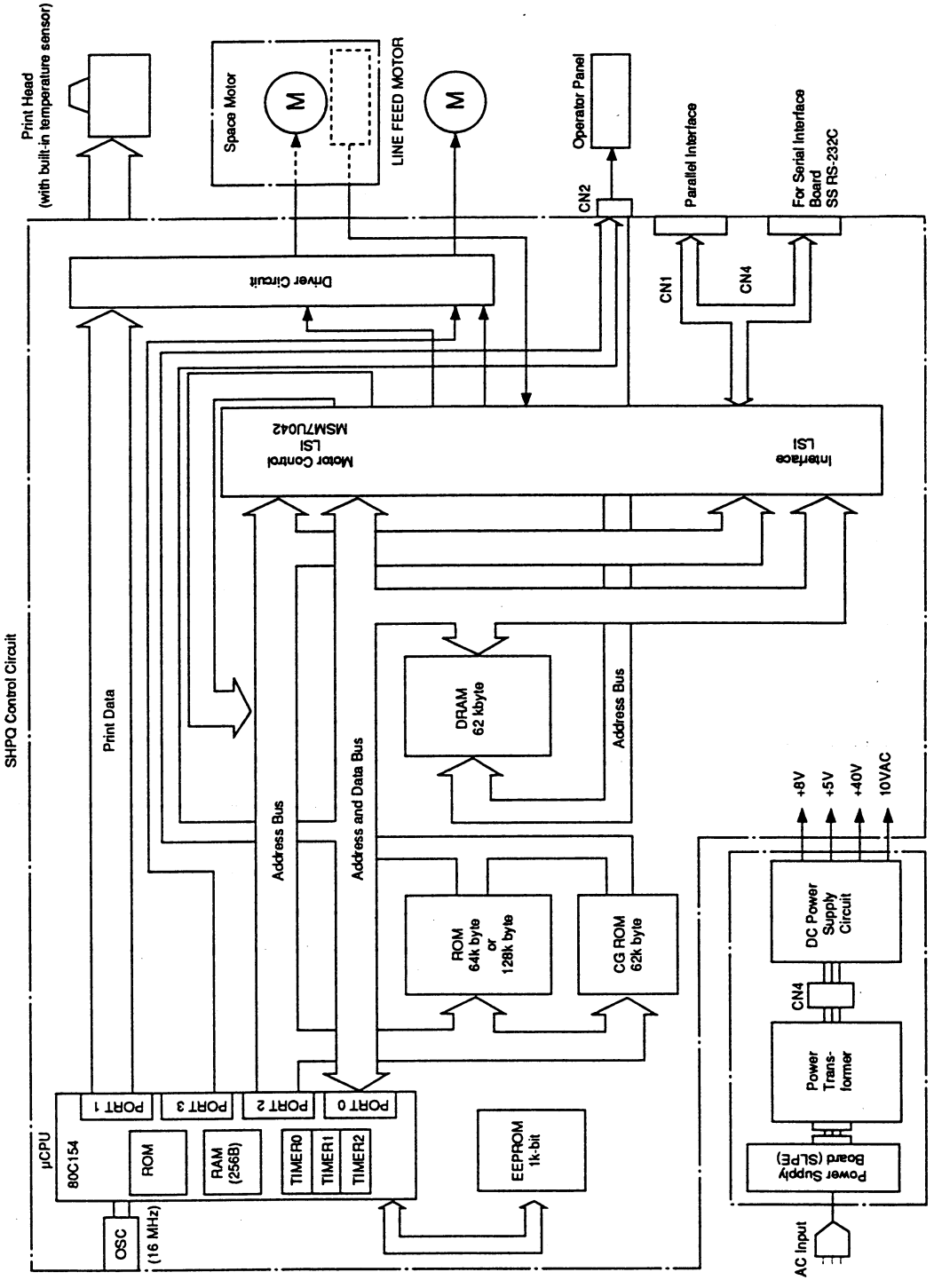


Figure 3-1 Block diagram

3.1.3 Initialization

The printer is initialized when the power is turned on or when the parallel interface signal I-PRIME is received from the host computer.

Initialization is started when the RST OUT signal is sent from the reset circuit (03A Pin 1) to 05D and 04B, and SRSTOUT is sent to each device. BUSY signal is active during initialization stage.

When reset is completed, ROM program execution starts with mode setting of 05D and 04B. Then a memory (ROM and RAM) check is performed, RAM is initialized, and the carriage is homed. The program finally establishes the interface signals (output level of ACK signal, BUSY signal, etc.), lights the SELECT indicator, and informs the host computer that the printer is ready for data reception (in the data reception wait state), completing initialization.

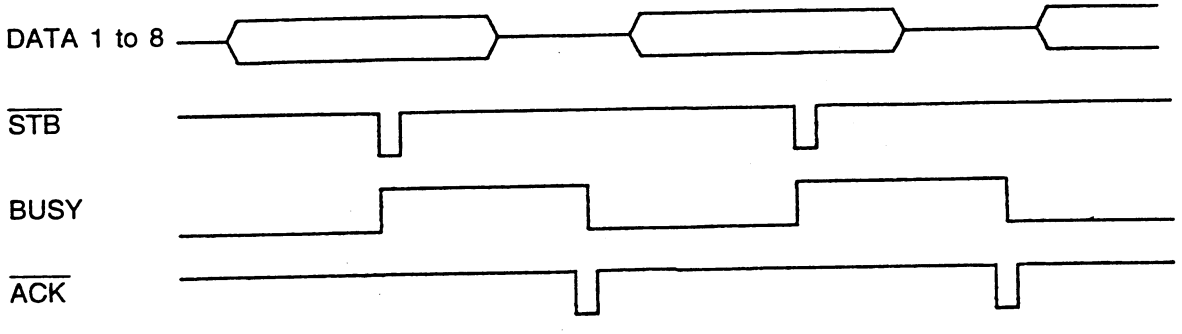
3.1.4 Interface control

(1) Parallel interface

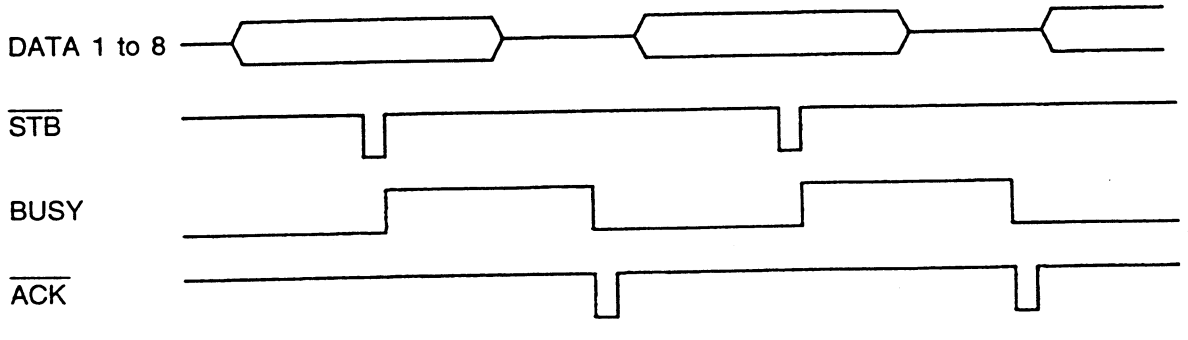
The data from the interface is input through a connector (CN1), and the interface LSI (04B: MSM7U042) latches this input data in synchronization with the $\overline{\text{STB}}$ signal.

The BUSY signal is on during processing of this data. When processing is completed, the BUSY signal is turned off, and an $\overline{\text{ACK}}$ signal is sent to request more data.
The BUSY signal is also on when data cannot be received (when the receiving buffer is full, etc.).

(a) Standard



(b) Special

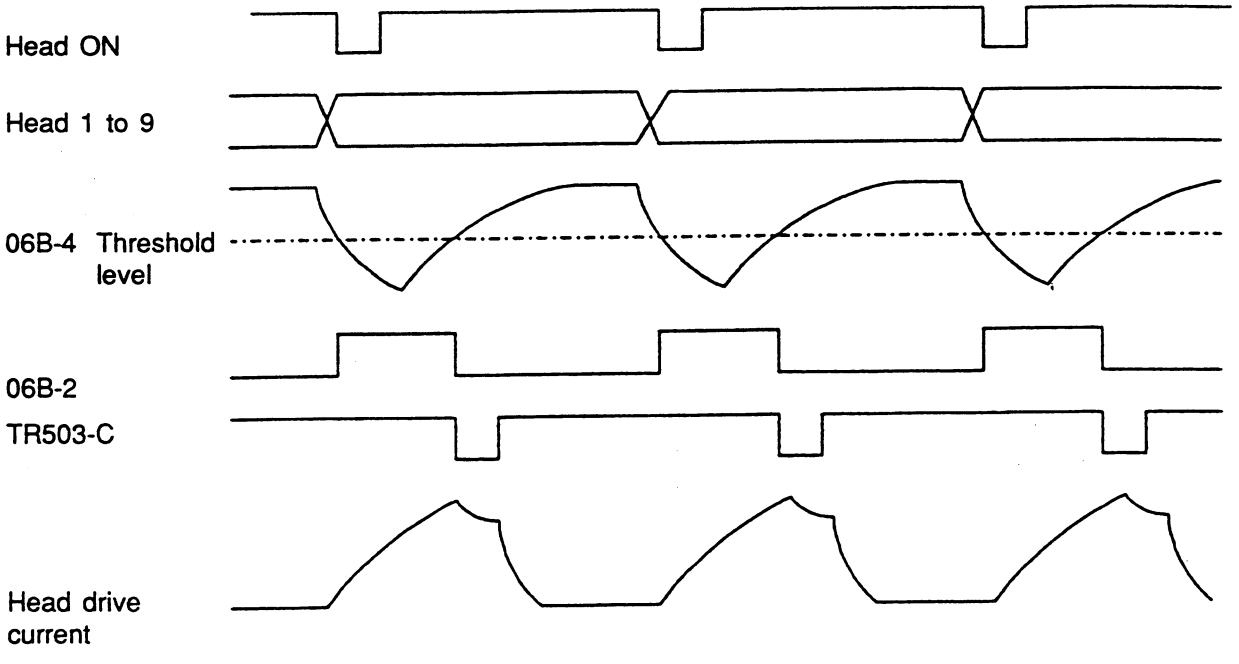


3.1.5 Print head drive circuit

This circuit drives the head magnets corresponding to the HEAD DATA1 to 9 signals in accordance with the HEAD-ON signal, making the print head to print characters.

When the HEAD-ON signal goes low, the RC integrator determines the head drive time. This integrator automatically compensates the printing pressure in accordance with the drive voltage (+40V).

That is, the integrator elongates the drive time if the drive voltage falls, and shortens the drive time if the drive voltage rises.



3.1.6 Spacing drive circuit

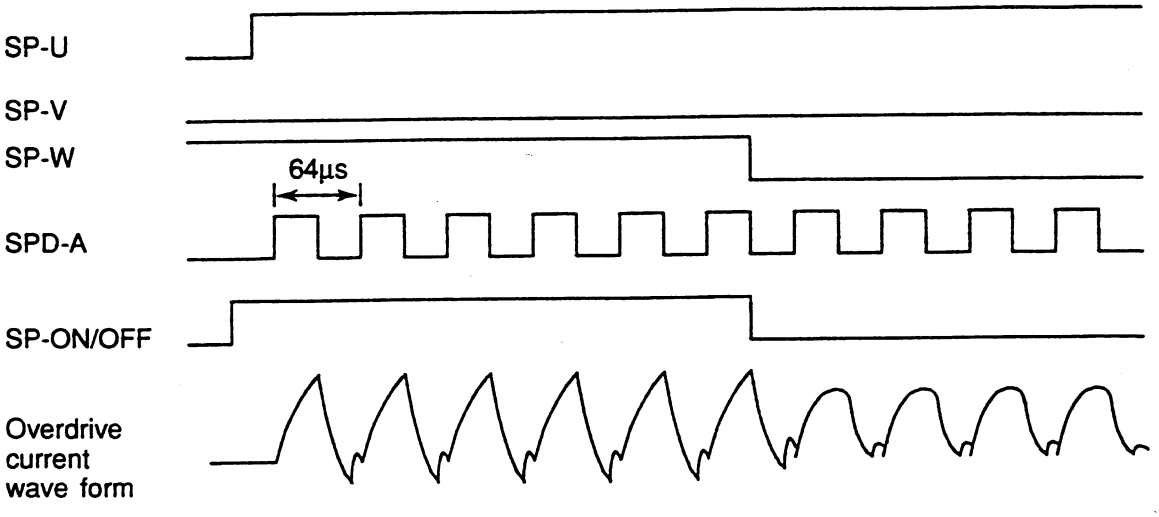
(1) Spacing motor control

The motor control LSI (04B: MSM7U042) outputs the spacing motor phase signals (SP-U, SP-V, and SP-W) in accordance with the spacing command from the microprocessor, and at the same time outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal. The pulse width is controllable by the program, and is used to control the motor drive time.

The SP ON/OFF signal is used to control acceleration and deceleration motor torque.

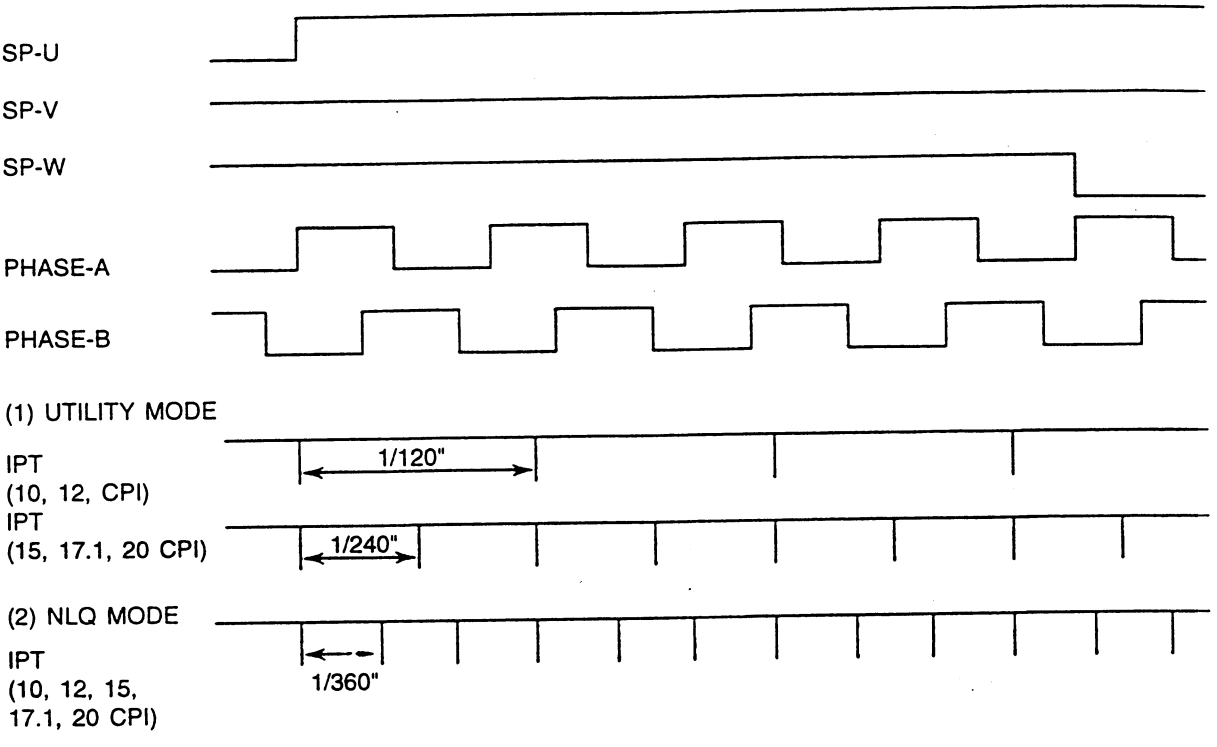
The motor driver (08E) drives the spacing motor in accordance with these signals. Pins 9 and 11 of the 08E are for the protection circuits against overvoltage and overcurrent, respectively.



(2) Encoder disk

In the operation of the spacing motor, the PHASE-A and PHASE-B signals are generated. When the encoder disk interrupts the photo sensor.

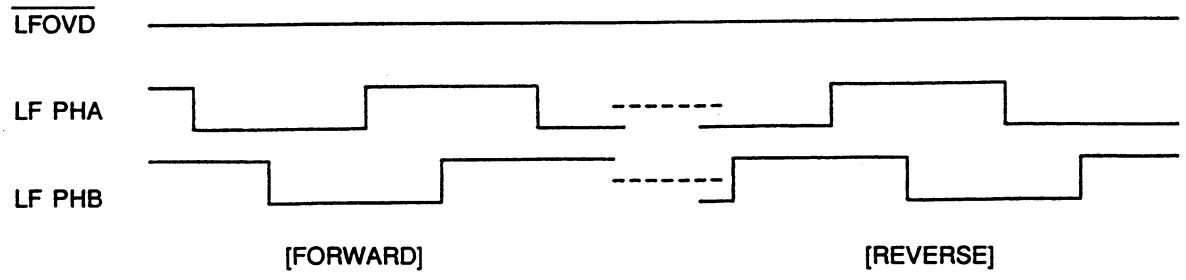
The motor control LSI (04B: MSM7U042) divides the frequencies of these edge pulse signals in accordance with the print pitch, and sends the IPT signal to provide dot-on timing and carriage position detection timing.



3.1.7 Line feed circuit

The line feed motor shaft is held stationary by the LF HOLD signal (holding current: approx. 100 ~ 190 mA) while it is at a stopped position.

During line feed operation, the line feed motor is driven by a large current supplied in accordance with LF OVD signal.



3.1.8 Alarm circuits

(1) Fault alarm circuit (in power supply unit)

This is a protective circuit which causes the AC fuse to open when a fault occurs in the print head drive circuit, space motor drive circuit, or their peripheral circuits, thus preventing component failure.

For this purpose, this circuit monitors the drive time using the HDALM and SPALM signals interlocked with the overdrive signal of each drive circuit. If the drive time of any drive circuit exceeds the specified time, the drive circuit fault alarm circuit sends an ALM signal (high) to turn the SCR (on the PSU) on.

This causes the secondary coil (40 V) of the transformer to be short-circuited, resulting in flow of overcurrent through the primary coil, causing the AC fuse to open.

(2) Print head overheat alarm circuit

In order to protect the head coils, this circuit monitors the head temperature using the built-in print head thermistor.

If heavy-duty printing is performed continuously for a long time, the print head temperature rises. When the head temperature reaches a certain value (about 100°C), a head overheat alarm is detected.

When the alarm is detected, the printing operation is halted to wait for the head temperature to fall. When the head temperature returns to a point below the alarm detection temperature, the printing operation is restarted.

The alarm detection is performed as follows:

When the temperature in the print head rises, the resistance of the thermistor falls and the potential of the comparator (06B) negative input falls to invert the comparator output, thus causing the HEAD TEMP signal to be sent to the motor control LSI.

3.1.9 Paper end detection circuit

When no paper is installed or an end of paper condition exists, the photo-sensor (PE) on the sensor board is turned off, changing the $\overline{\text{PAPER END}}$ signal to a low level. This signal is fed to Pin 60 of the motor control LSI (04B), which causes the printing operation to halt and the ALARM indicator to illuminate.

3.1.10 Power supply

The power supply consists of a power transformer, filter board, and DC power supply board.

The input AC voltage is transformed into 8.6 VAC, 46 VAC, and 10 VAC by the power transformer. These AC voltages are rectified to +8 VDC, +5 VDC, and +40 VDC levels by the DC power supply board and supplied to the control board.

(1) Filter board

The filter board consists of the power switch, AC fuse and AC noise filter.

(2) Power transformer

If the internal temperature of the power transformer rises abnormally, the built-in thermal fuse opens to prevent any damages to other electrical components.

(3) Power supply board

Rectifies the AC voltage input to +8 VDC, +5 VDC and +40 VDC and supplies them to the control board.

3.2 Mechanical Operation

3.2.1 The print head mechanism and its operation (See Figure 3.3.)

The print head is a spring charged type 9-pin driving head utilizing a permanent magnet. It is attached to the carriage and moves in parallel with the platen. Electrically, this unit is connected to the control circuits through the control board.

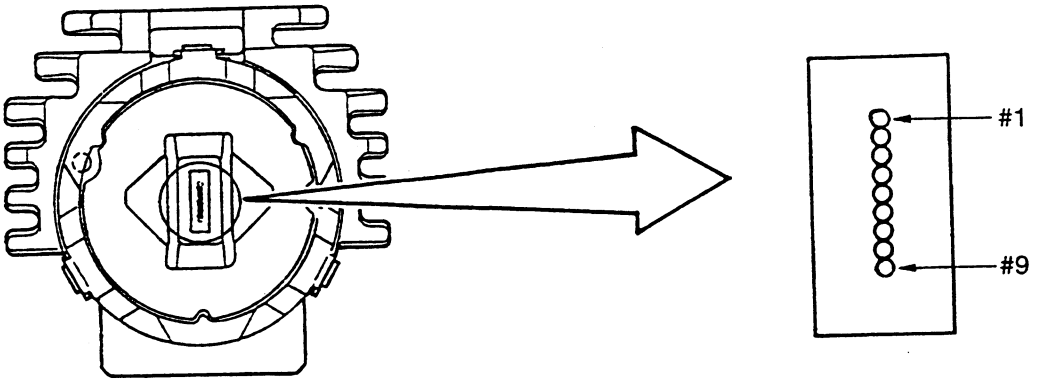


Figure 3-2 Arrangement of the head pins (View from the tip of the print head)

(1) The print head is composed of the following parts:

(a) Wire guide
(b) Print wires
(c) Armature assembly
(d) Yoke
(e) Spring
(f) Spacer
(g) Magnet assembly
(h) Thermistor
(i) Printed circuit board

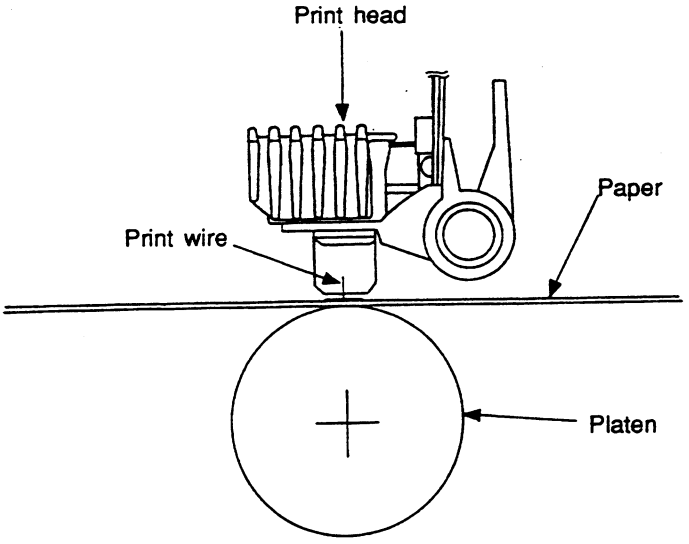
(2) Operation of print head (See Figure 3-3.)

When the print head is idle, the armature is attracted by the permanent magnet and the spring fixing the armature is compressed. The print wires fixed to each armature are thus concealed under the wire guide.

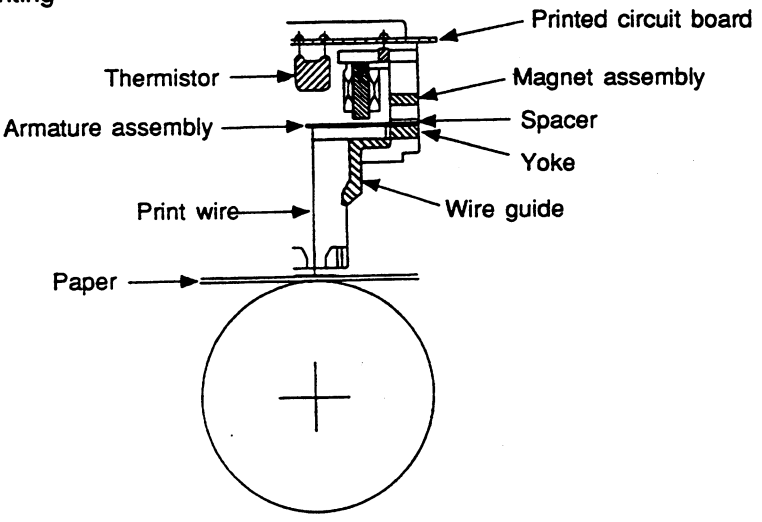
When a signal for a character to be printed is detected, current flows through the coil. When the coil is activated, the magnetic flux (caused by the permanent magnet between the armature and the poles) is cancelled to eliminate the attraction force. The armature is driven in the direction of the platen by the force of the armature spring. The print wire fixed to the armature protrudes from the tip of the wire guide, strikes the paper through the ribbon and prints a dot on the paper.

When a character is printed, the armature is magnetically attracted again and the print wires are again concealed under the wire guide.

A thermistor in the print head prevents burning caused by over-heating of the coil during extended continuous bi-directional printing. When the temperature of the coil exceeds a pre-determined limit (about 110°C), the control circuit detects a thermistor signal. Printing then becomes intermittent or stops completely until the coil temperature falls below the limit value.



(1) When printing



(2) When not printing

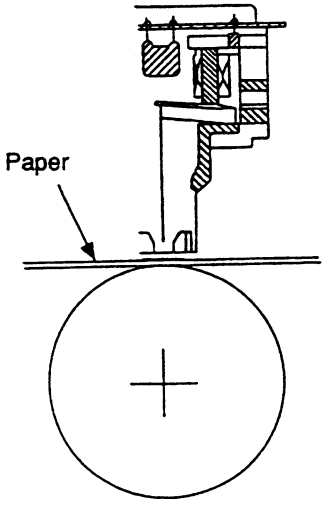


Figure 3-3

3.2.2 Spacing (see Figure 3-4)

The spacing mechanism consists of a carriage shaft which is mounted in parallel with the platen, and a carriage frame which slides over the shaft. A DC motor which is mounted on the bottom surface of the carriage frame is used to move the carriage frame. The spacing mechanism consists of the following items:

(a) DC motor with gear (motor PC board included)

(b) Carriage frame

(c) Carriage shaft

(d) Space rack

(e) Encoder sensor

(f) Encoder disk

(1) Spacing operation

The carriage frame, which is connected to the print head and space motor, slides over the carriage shaft in parallel with the platen. When the space motor turns in clockwise direction, the motor gear rotates against the space rack, moving the carriage from left to right.
For every complete turn of the DC motor, the carriage frame moves 0.8 inch (20.32 mm).

The encoder disk rotates together with the motor, interrupting the encoder sensor. The position of the carriage frame can be determined by counting the number of times the encoder sensor has been interrupted.

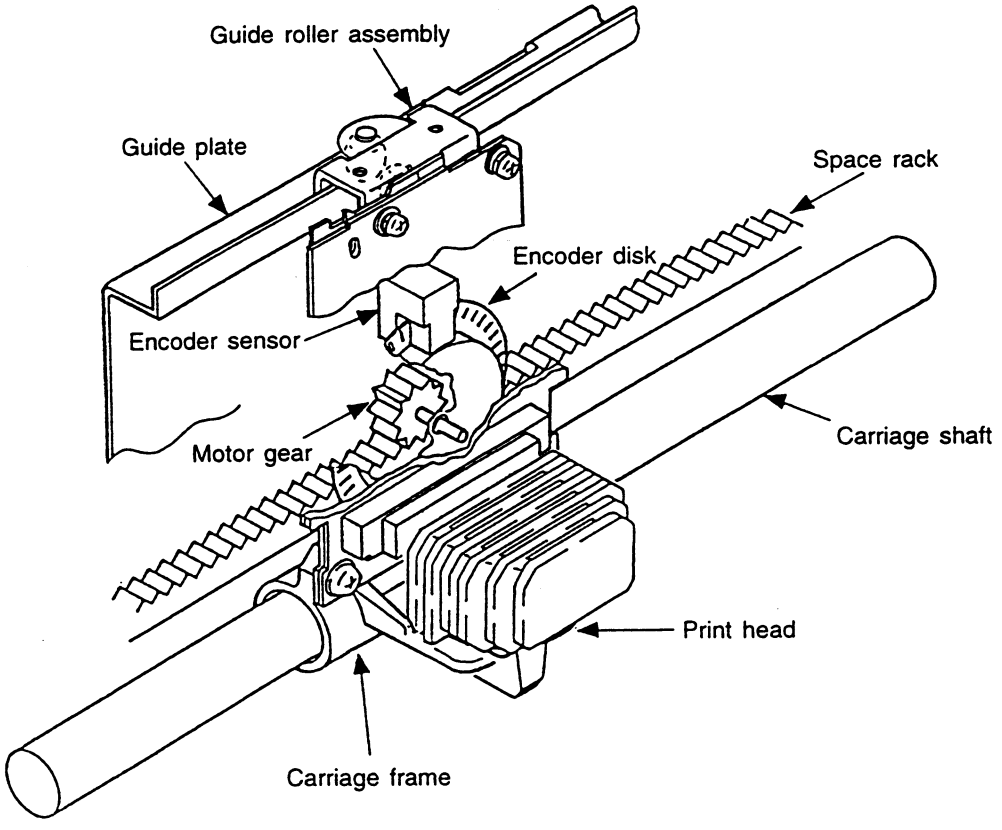


Figure 3-4

3.2.3 Head gap adjusting (see Figure 3-5)

The head gap adjusting function adjusts the gap between the print head and the platen. Raising or lowering the lever moves the carriage shaft up or down to adjust the gap.

Move the adjust lever. Its carriage shaft rotates. The adjust bushes (L) and (R) restrict the orientation of the eccentric fulcrum of the adjust lever (the part that engages with the carriage shaft). So, as the carriage shaft rotates, it is raised or lowered within the side frames. As the carriage shaft is raised or lowered, the print head moves closer to or away from the platen.

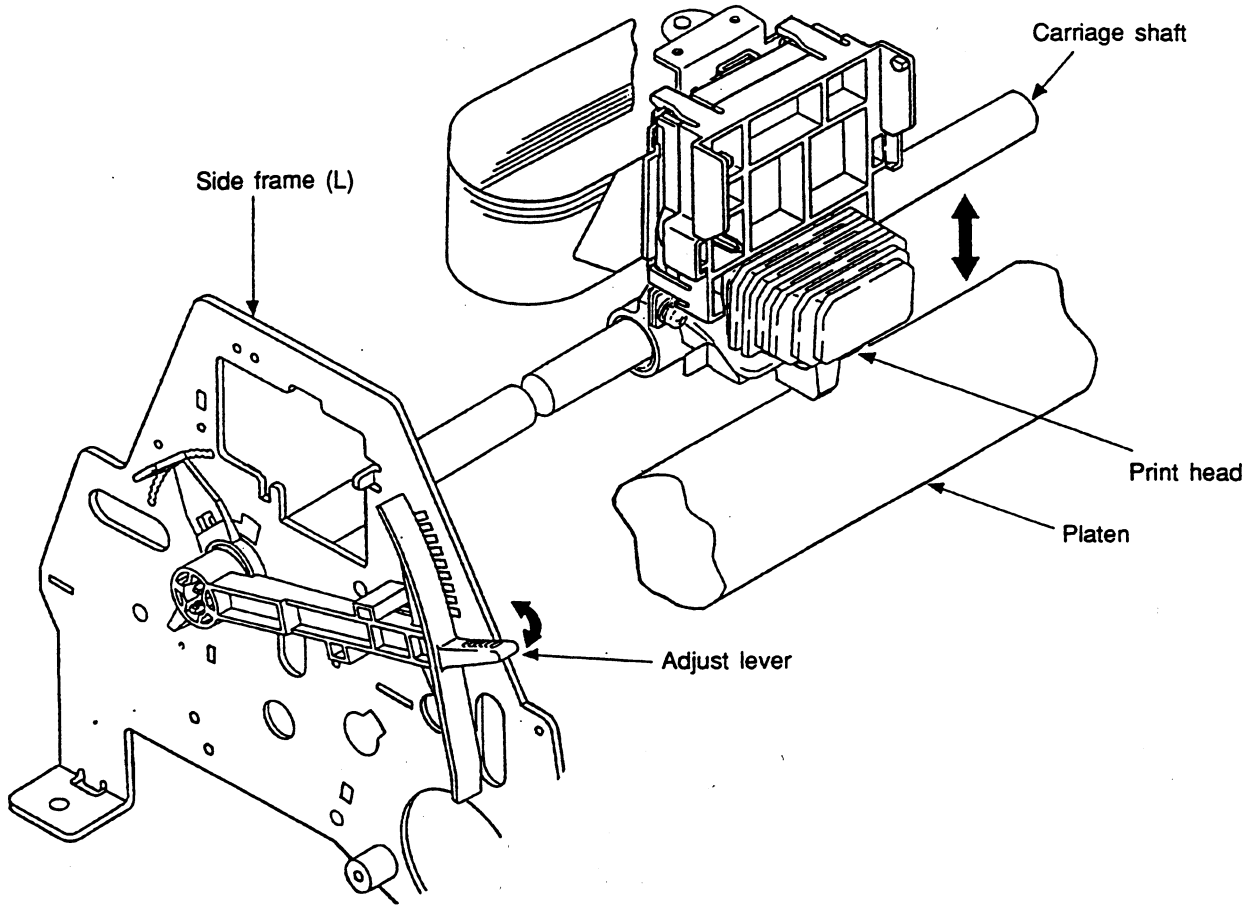


Figure 3-5

3.2.4 Ribbon drive (see Figure 3-6)

The ribbon drive mechanism moves the ribbon in synchronization with the space motor operation.

The ribbon drive mechanism consists of the following items:

(a) Ribbon drive gear assembly

(b) Ribbon gear (space motor)

(c) Ribbon cartridge

(1) Ribbon cartridge

An endless ribbon with a single direction feed is used. Ink is supplied from an ink tank, which is built into the ribbon cartridge.

(2) Ribbon drive operation

When the space motor is activated, the ribbon gear rotates. The rotation is transmitted via the ribbon drive gear assembly to the drive gear in the ribbon cartridge, thus moving the ribbon.

The feed direction of the ribbon is maintained by switching the rotational direction of the gears in the ribbon drive gear assembly. This ensures ribbon movement when bidirectional printing is used.

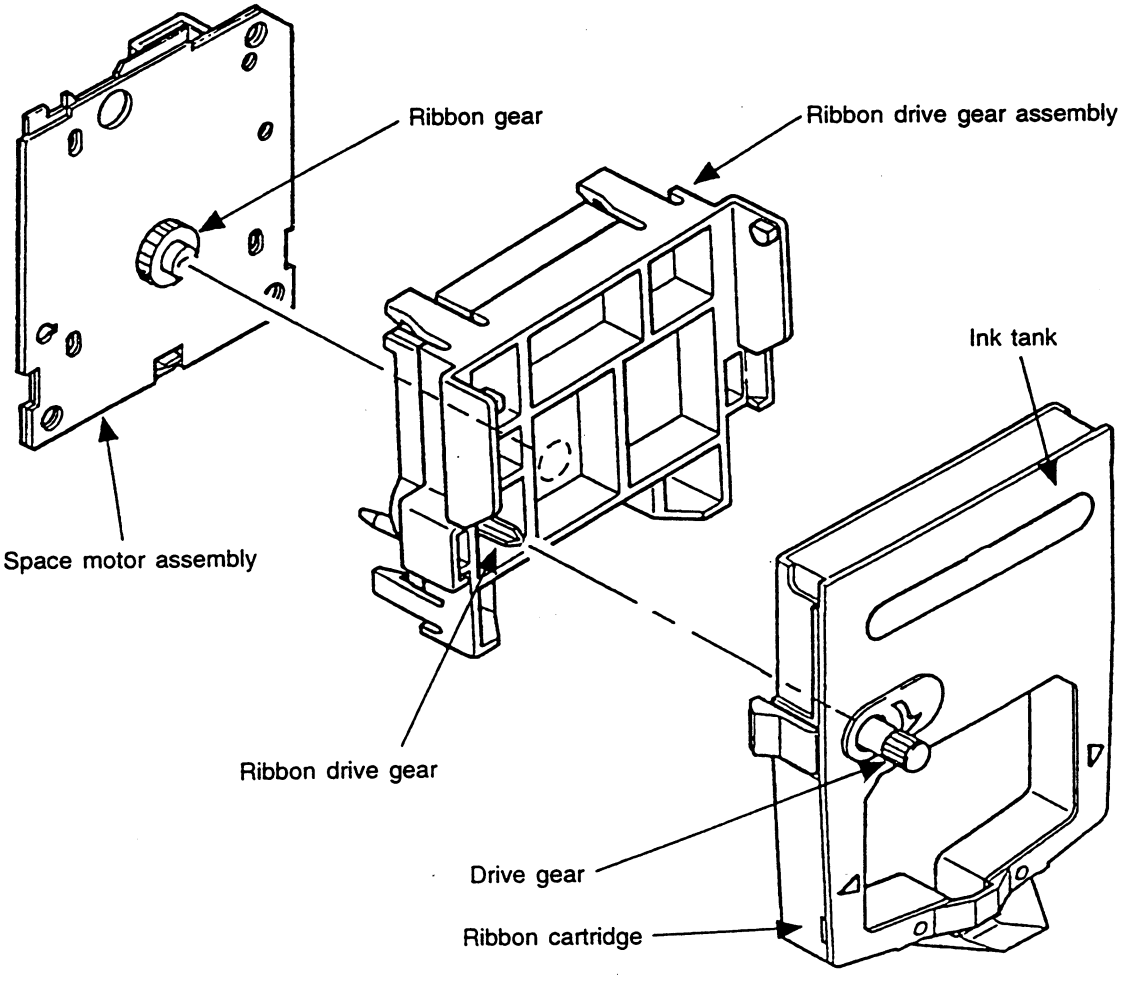


Figure 3-6

3.2.5 Paper feeding

Paper feeding is performed by turning the platen and the pin tractor, which is driven by the LF pulse motor.

The paper feeding mechanism consists of the following items:

(a) Pulse motor with gears

(b) Decelerating gears

(c) Platen

(d) Tractor feed unit

(e) Line feed roller

(1) Cut-sheet feeding operation (See Figure 3-7.)

The pulse motor used for the paper feeding mechanism is mounted on the left side of the printer frame, and the rotation of the motor is transmitted through decelerating gears (idle gear, platen gear) to the platen. The rotation of the platen is also transmitted to the line feed roller.

It is designed in such a way that if the pulse motor turns 48 steps (360°), paper is fed 1/6 inch (4.23 mm).

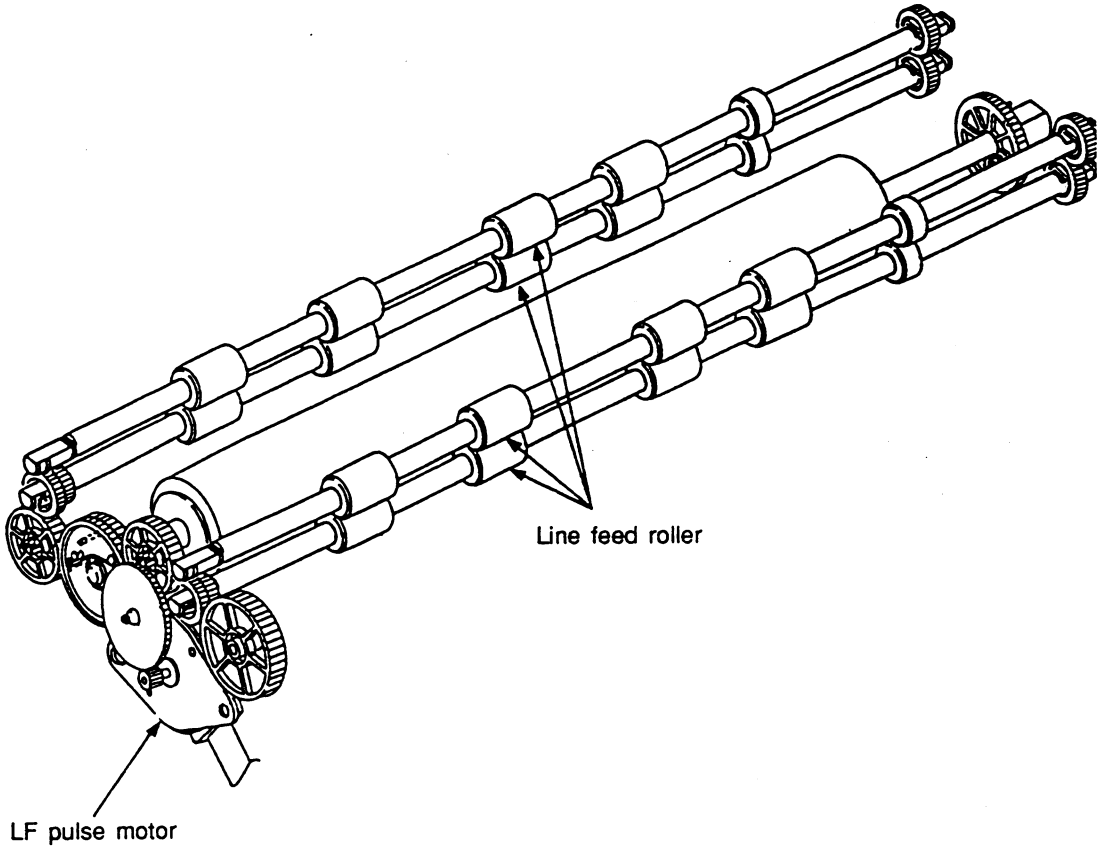


Figure 3-7

(2) Continuous paper feeding operation (see Figure 3-8)

The LF pulse motor drives the line feed roller and the pin tractor to feed the continuous paper.

- Paper feeding

  The pulse motor for paper feeding is located on the left side frame. The pulse motor drives the platen gear assembly via the decelerating gear. The platen gear assembly directly connected to the platen drives the line feed roller via the idle gear. If switched to the change gear, the line feed roller drives the pin tractor. The LF pulse motor is mechanically designed to feed the paper 1/6 inch (4.23 mm) with a turn of 48 steps (360°)

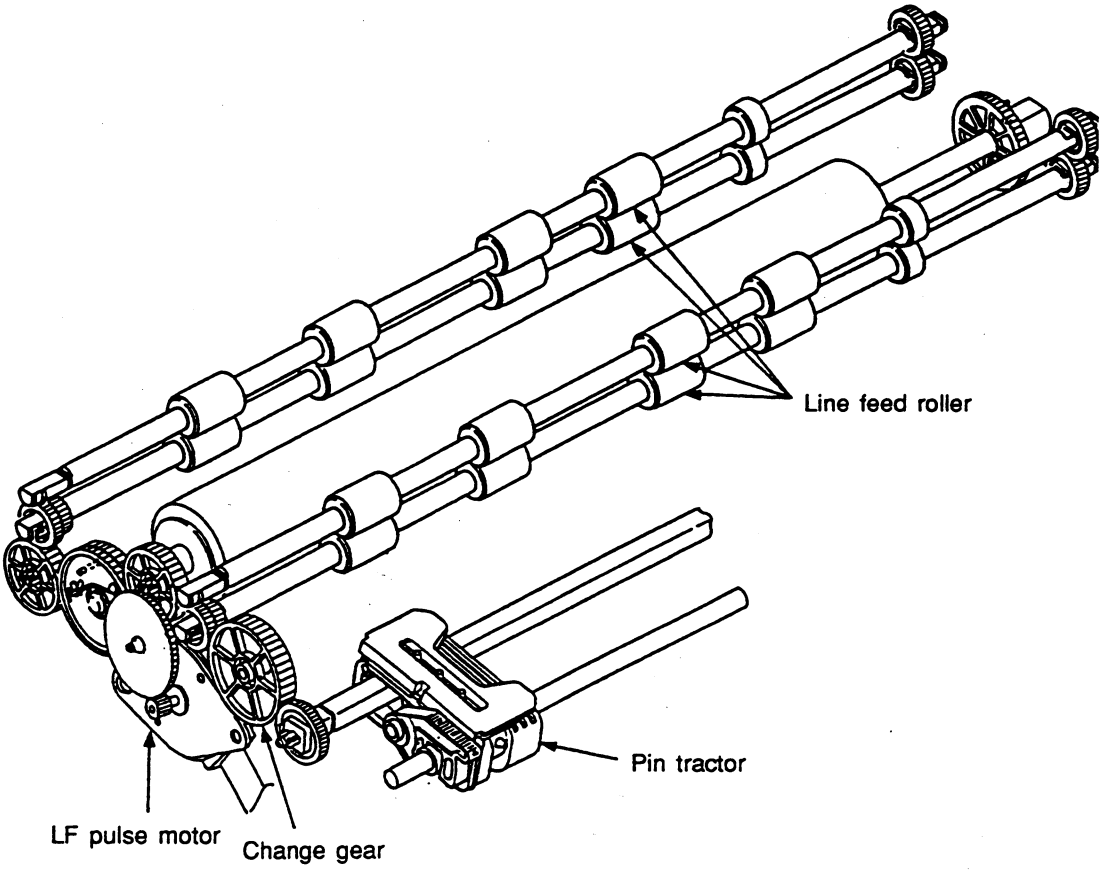


Figure 3-8

(3) Cut-sheet and continuous paper switching mechanism (see Figure 3-9)

Set the paper release lever to the cutsheet paper position (front). The pressure roller presses on the line feed roller via change arm A. This sets the feeding of cutsheet paper. Set the paper release lever to the continuous forms (rear) position. Change arm A raises the pressure roller to stop pressing the line feed roller. The change gear built into the change arm lowers and switches to the tractor gear side. This sets the feeding of continuous forms.

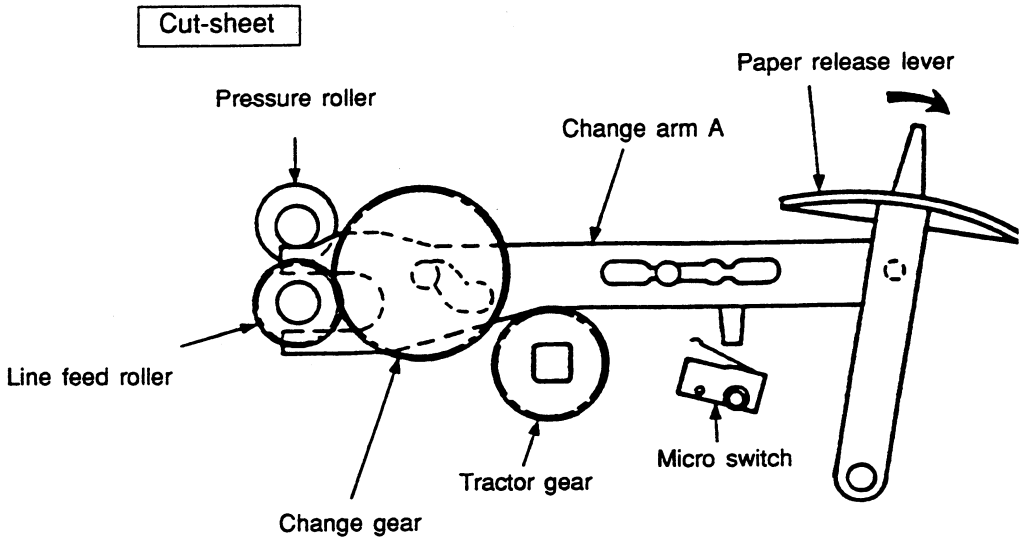
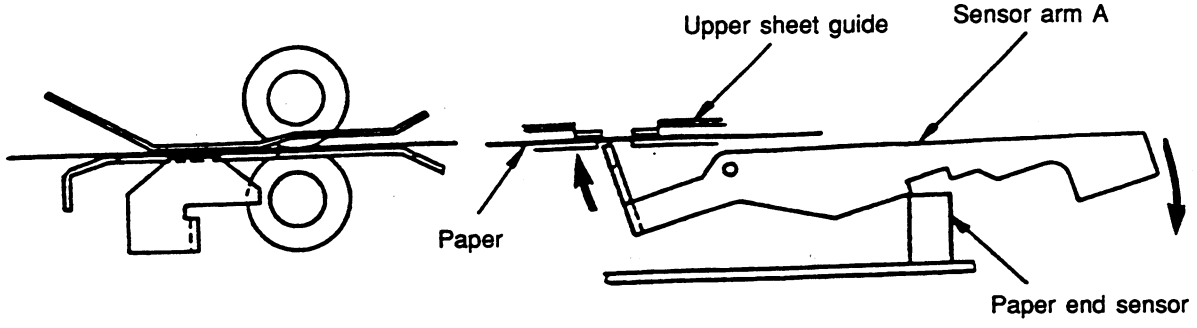


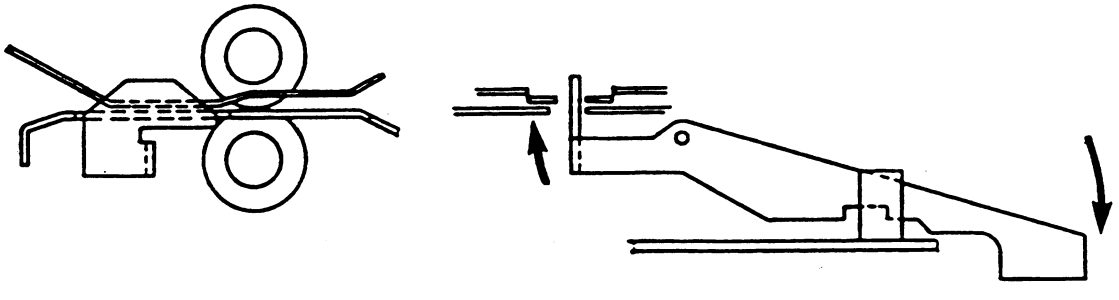
Figure 3-9

3.2.6 Paper end detection (see Figure 3.10)

When the paper is inserted, the paper end sensor is turned on. This is because the inserted paper prevents the tip of the sensor arm A from entering the upper sheet guide groove. When the paper is out, the tip of the sensor arm A enters the groove of the upper sheet guide and the other side of the sensor arm A intercepts the sensor. Hence, the paper end sensor detects the end of paper. The sensor detects the end of the paper when the remaining paper length is about 22 mm from the print position.



Paper is inserted



No paper inserted

Figure 3-10

3.2.7 Semi-automatic sheet feeder (SASF) (see Figure 3-11)

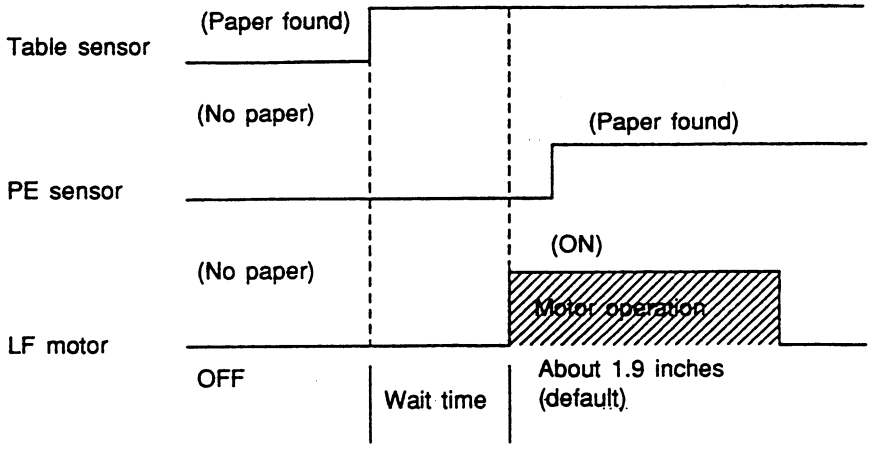
This function automatically feeds the cut-sheet or continuous forms set in the table.

(1) Theory of paper feeding

1) When the paper is loaded on the table, it is inserted until the table sensor detects the paper.

2) Once the sensor detects the paper, line feeding starts after a specified time (*1) (1 sec., 2 sec., or 500 ms).

3) The paper is fed into the pre-set paper feed position (*2). This ends the line feeding.

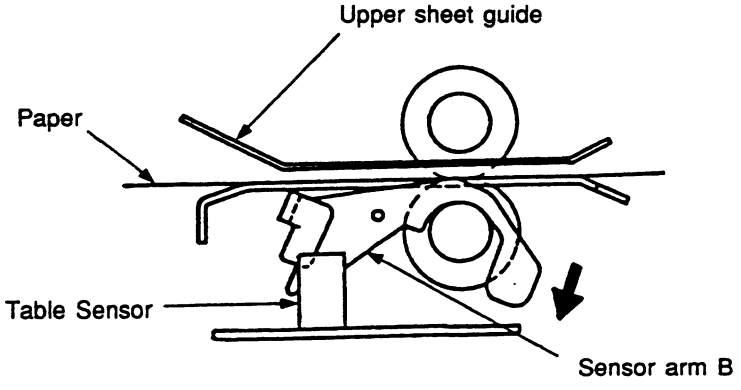


*1 Set up in the menu (wait time; 1 sec., 2 sec., or 500 ms)

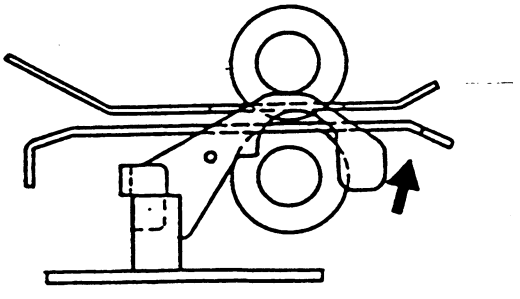
*2 The distance from the top of the paper to the center of the character is 6.35 mm by default.

Table Sensor Detection

When the paper is on the table, the table sensor is turned on. This is because the paper prevents the tip of the sensor arm B from entering the upper sheet guide groove. When the paper is out, the tip of the sensor arm B enters the groove of the upper sheet guide and the other side of the sensor arm B intercepts the sensor. Hence, the table sensor detects the end of paper.



Paper is inserted

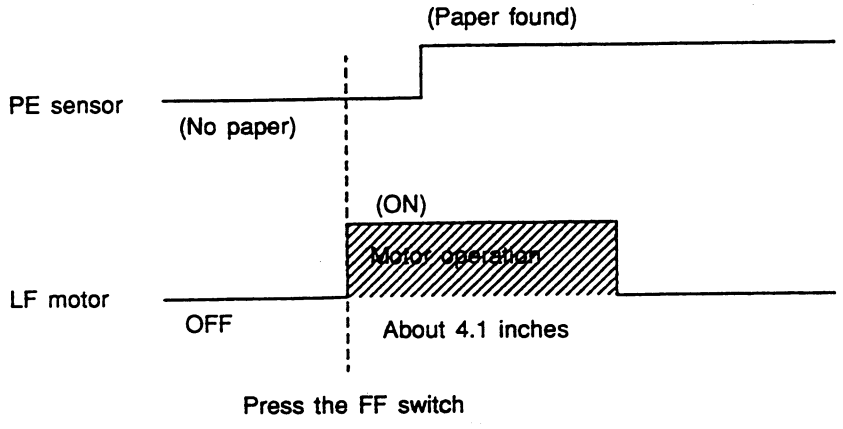


No paper inserted

Figure 3-11

(2) When using continuous sheets (auto load)

1) Set the paper switch lever to the continuous sheets side.
2) Set the paper in the push tractor.
3) Push the FF switch.
4) Start line feeding and feed the paper up to the print position.
5) Feed about 4.1 inches.

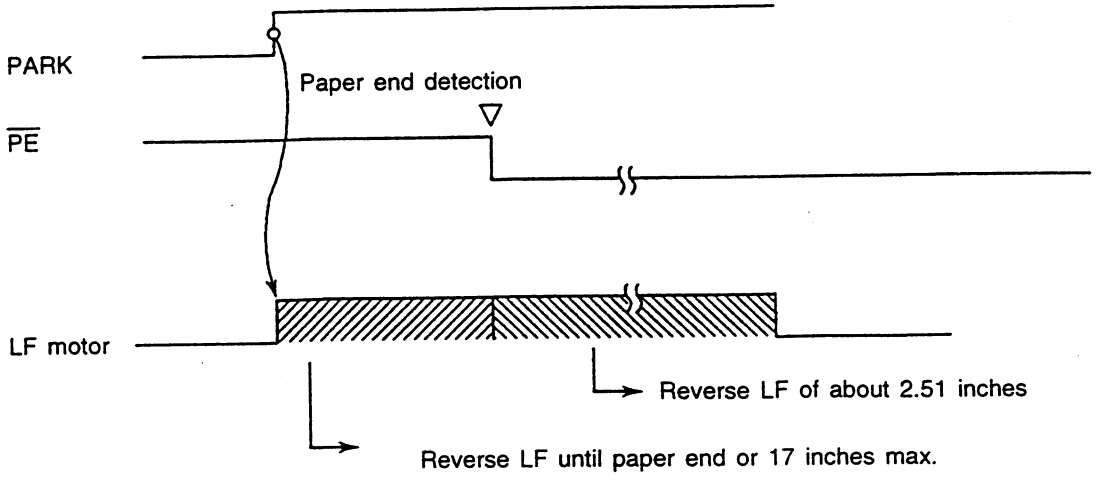


3.2.8 Reversing continuous sheets

Continuous sheets which have been inserted can be reversed automatically by using the PARK switch on the operator panel.

Its operation is as follows:

1) Press the PARK switch on the operator panel.
2) Reverse LF starts and sheet is fed in the reverse direction until paper end occurs or 17 inches maximum, whichever comes first.
3) Then the paper is fed about 2.51 inches in the reverse direction, leaving the sheet on the push tractor only.

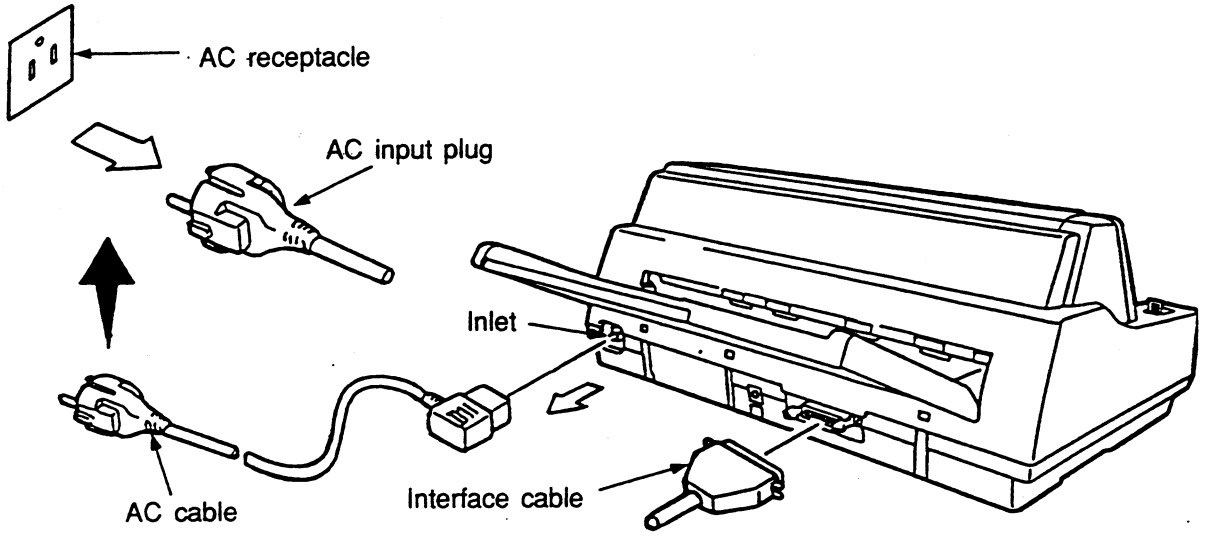


4. DISASSEMBLY/REASSEMBLY

4. DISASSEMBLY/REASSEMBLY

4.1 Precautions for Parts Replacement

(1) Disconnect the AC cable and interface cable before disassembly or reassembly of the printer.
   (a) Turn the AC power switch off. Disconnect the AC input plug of the AC cable from the AC receptacle, then disconnect the AC cable from the printer inlet.
   (b) To reconnect the AC cable, first connect the AC cable to the printer inlet, then connect it to the AC receptacle.



(2) Do not disassemble the printer as long as it is in good operating condition.

(3) Do not remove parts unnecessarily. Disassembly should be kept to the minimum necessary.

(4) Use only specified maintenance tools.

(5) Disassemble the printer in the specified order laid out in disassembly procedures.

(6) ICs such as the microprocessor, ROM, and RAM can be damaged easily by static electricity. Do not wear any kind of clothing which may produce static electricity when handling printed circuit boards.

(7) Do not place the printed circuit boards directly on the printer or floor.

4.2 Maintenance Tools

Table 4-1 lists tools required for replacing parts such as printed boards and units in the field. Other tools may be necessary for other maintenance procedures.

Table 4-1 Maintenance Tools

No.	Maintenance tool	Quantity	Purpose of tool	Remarks
1	No. 1-100 Phillips screwdriver	1	2 to 2.6 mm screw	
2	No. 2-100 Phillips screwdriver	1	3 to 5 mm screw	
3	No. 3-100 screwdriver	1		
4	No. 5 nipper	1		
5	Round pliers No. 3	1		
6	Thickness gauge	1	Head gap adjusting	
7	Flat-blade screwdriver	1	(Removing the upper cover)	

4.3 Disassembly and Reassembly

This section explains the disassembly and reassembly procedures of the printer into the components listed below. Only the disassembly procedures are described. For reassembly, simply reverse these procedures.

4.3.1 Upper cover assembly
- 4.3.2 Space rack
- 4.3.3 Printer unit
  - 4.3.4 SHPQ-PCB (control board)
  - 4.3.5 SHPT-PCB (sensor board)
  - 4.3.6 Power supply board (power supply unit)
  - 4.3.7 Transformer (power supply unit)
  - 4.3.8 Filter assembly (power supply unit)
  - 4.3.9 LF pulse motor
    - 4.3.10 Platen assembly
  - 4.3.11 Micro switch assembly
    - 4.3.12 Feed roller shaft
- 4.3.13 SHPO-2-PCB (operator panel)
- 4.3.14 Tractor assembly (Right, Left)
- 4.3.15 Table assembly
- 4.3.16 Feed roller spring
- 4.3.17 Stacker shaft

4.3.18 Print head
- 4.3.19 Ribbon feed gear assembly
  - 4.3.20 Space motor assembly
  - 4.3.21 Head cable
  - 4.3.22 Guide roller

4.3.1 Upper cover assembly

[Note] *Remove the cutsheet feeder (option), if mounted.*

(1) Remove the platen knob ① and remove the sheet stacker ②.

(2) Raise the adjust lever ③ to its upper most position to open table assembly ④.

(3) Remove the tapping screw ⑤, then remove the cover stopper ⑦ at two locations.

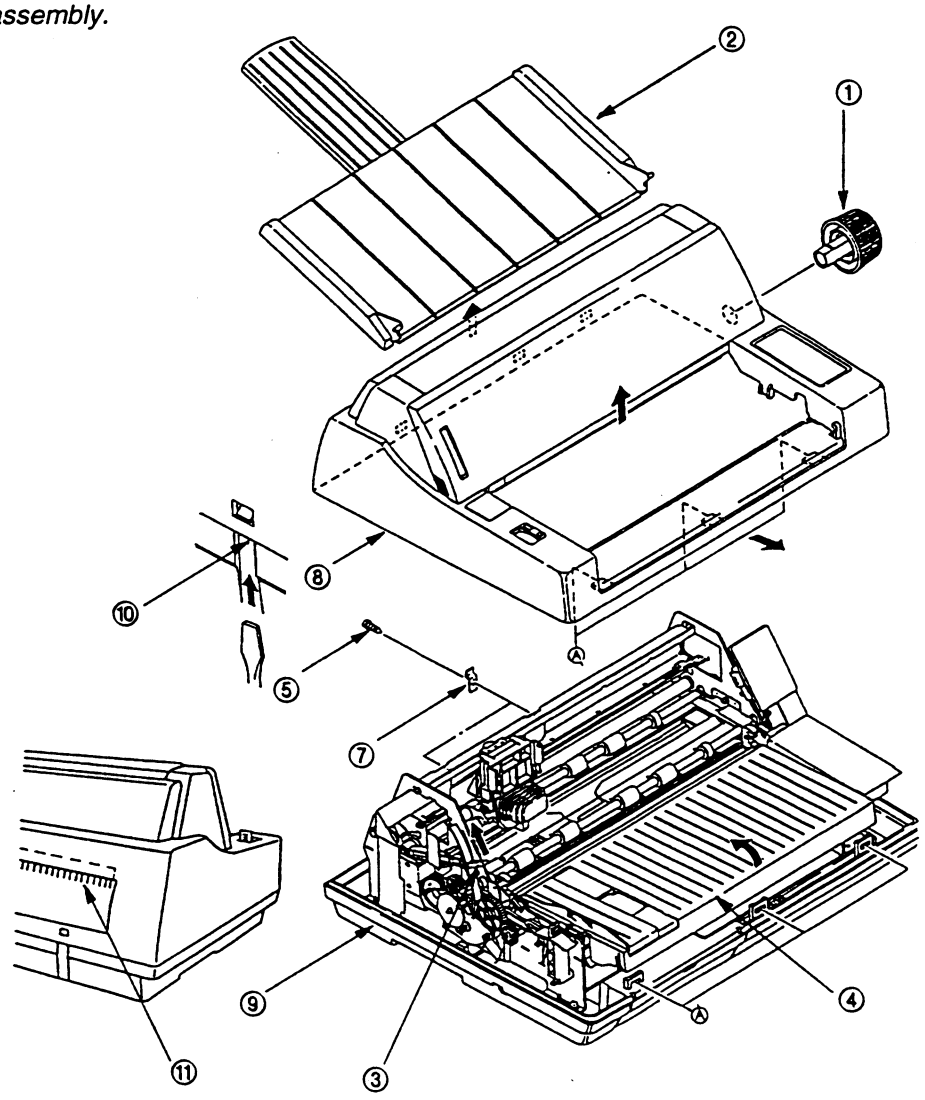
(4) Disengage the upper cover assembly ⑧ from the lower cover assembly ⑨ in three rear locations. To disengage the upper cover assembly, insert a flat-blade screwdriver into the three grooves ⑩ of the lower cover assembly.

(5) Disengage the upper cover assembly ⑧ from the lower cover assembly ⑨ in three front locations. To disengage the upper cover assembly, raise the rear part a little and slide it forward using the front part of the upper cover assembly as the fulcrum.

(6) Lift the upper cover assembly ⑧ up and off the unit.

[Notes on reassembly]

- *When reinstalling the upper cover assembly ⑧, be careful to make sure that the discharging brush ⑪ in the rear of the upper cover assembly does not get caught by the upper cover assembly.*



4.3.2 Space rack

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the spring ① and unlock the claw ④ of the space rack ③ from the hole of the carriage guide plate ②.

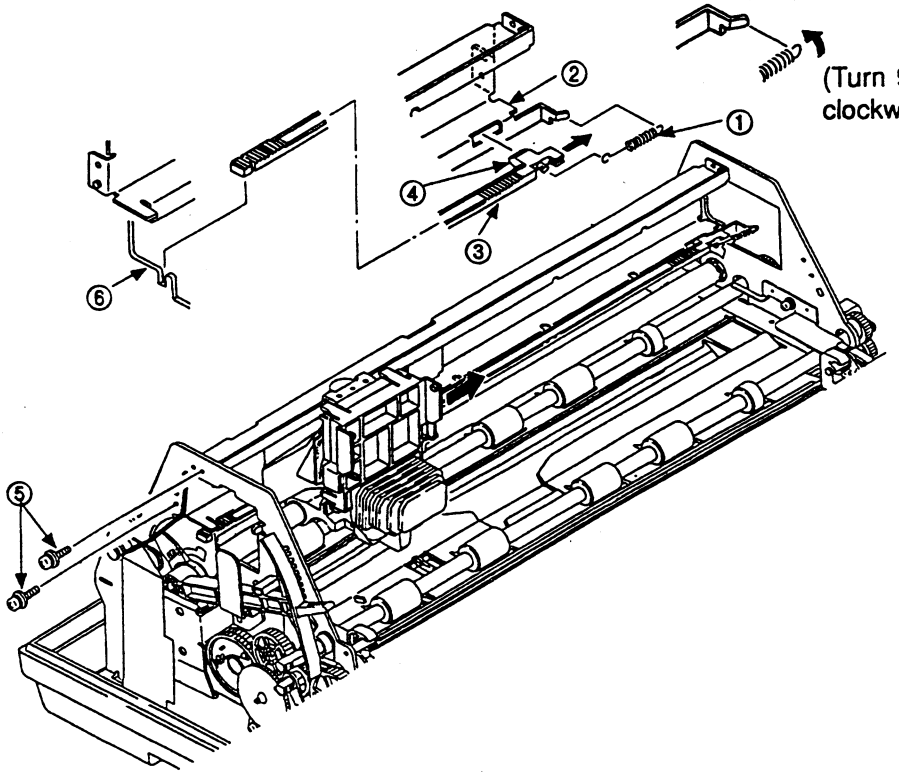
(3) Slide the carriage unit to the right.

(4) Remove the two screws ⑤ to remove the protruding part of the carriage guide plate ②, from the hole of the side frame ⑥.

(5) Remove the space rack ③ from the notch of the side frame ⑥ and slowly draw it out from the right side.

[Notes on reassembly]

- *When reinstalling the carriage guide plate ②, make sure that it touches the top surface of the space rack ③.*
- *Before reinstalling the spring ①, twist the right side of the spring 90° clockwise.*
- *Make sure to lock the claw ④ of the space rack ③ firmly into the hole of the carriage guide plate ②.*
- *Firmly insert the protruding part of the carriage guide plate ② into the hole of the side frame ⑥ and fix it in place with screws.*
- *After reinstallation, check the gap between the print head and the platen and adjust the gap if necessary (see Section 5.1).*



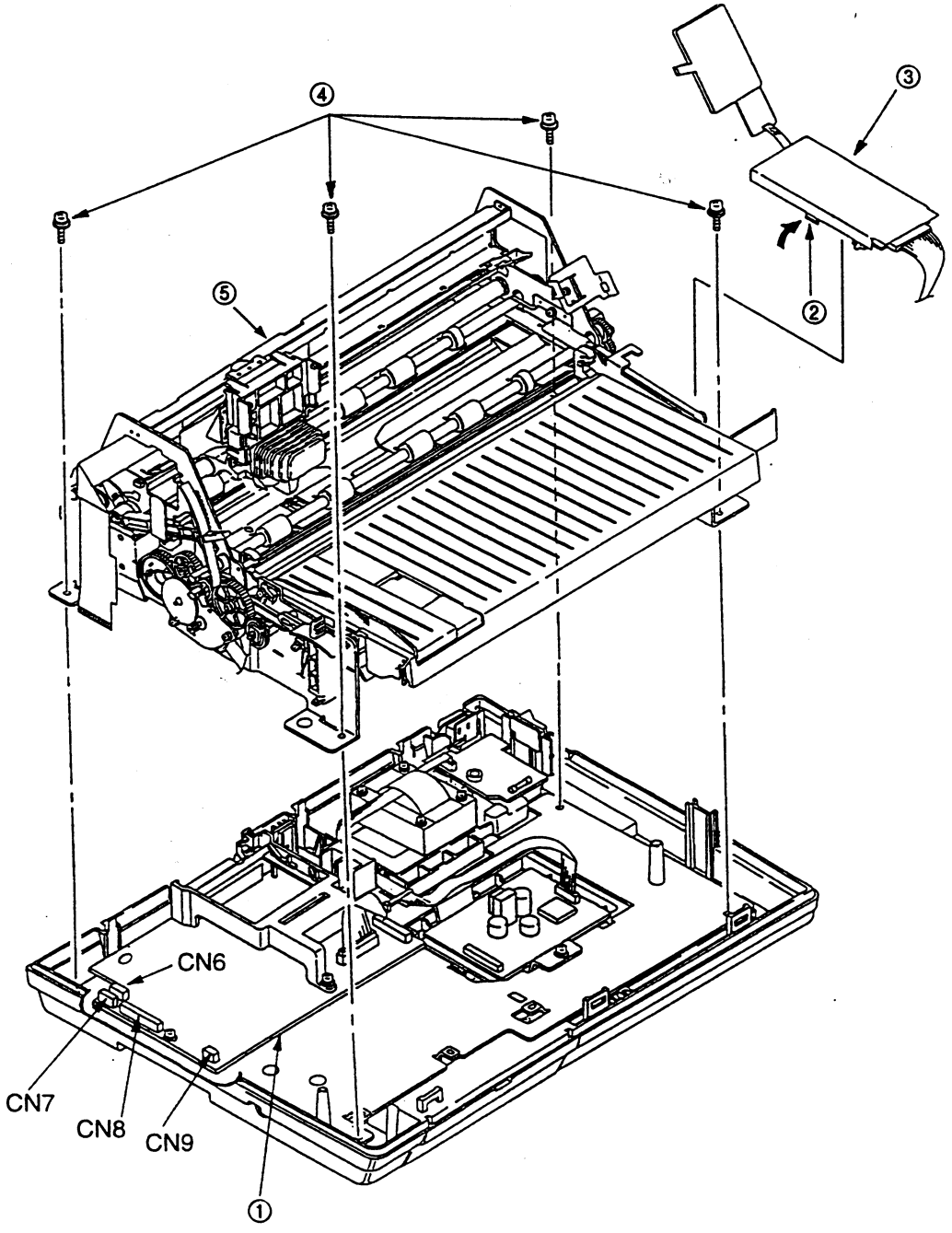
4.3.3 Printer unit

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the cable from the connectors (CN6, CN7, CN8, and CN9) of the SHPQ PCB ①.

(3) Slide the operator panel assembly ③ closer towards you and draw it out while pressing the claw ②.

(4) Remove four screws ④ to remove the printer unit ⑤.



4.3.4 SHPQ-PCB (control board)

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

(3) Remove the cable from the connectors (CN2 and CN3) on the SHPQ-PCB ①.

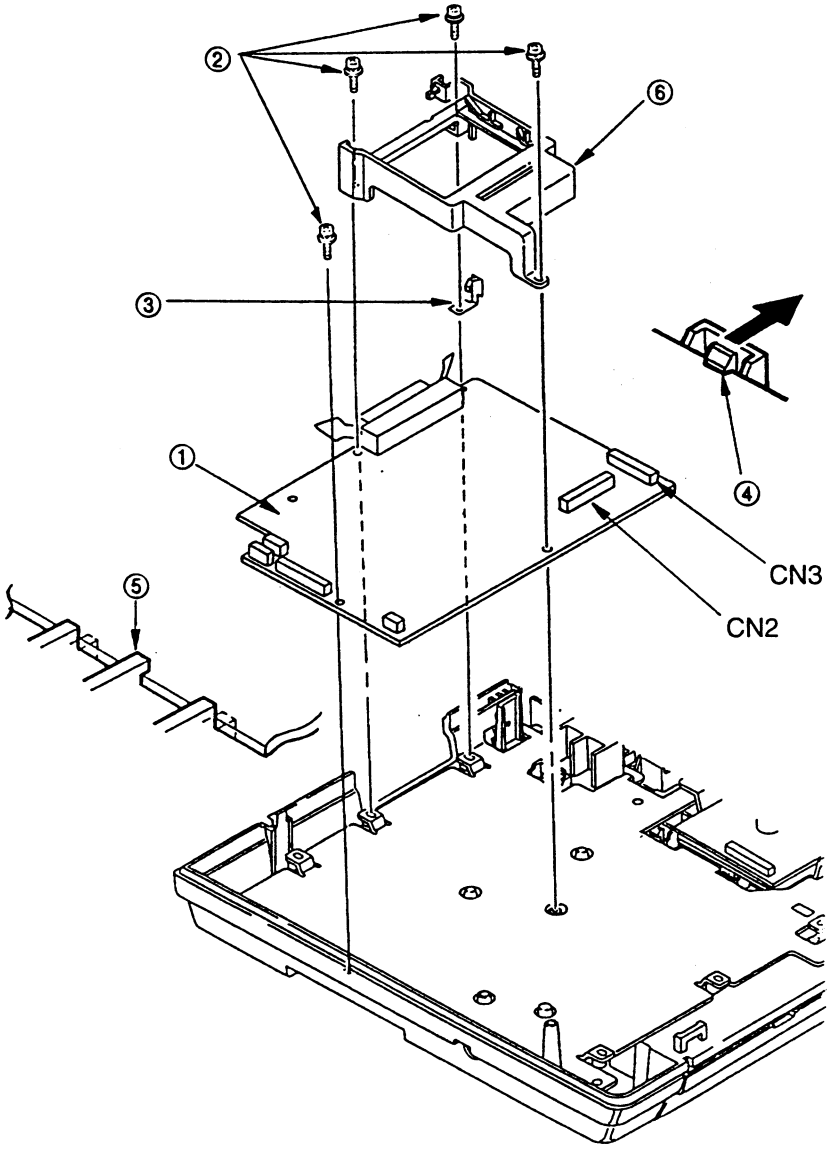
(4) Remove four screws ②.

(5) Remove the I/F bracket ⑥ and FG spring ③ at the same time.

(6) Unlock two claws ④ and remove the SHPQ-PCB ①.

[Notes on reassembly]

- *Make sure that the SHPQ-PCB ① is locked firmly with the two claws ④ and guide ⑤.*



4.3.5 SHPT-PCB (sensor board)

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

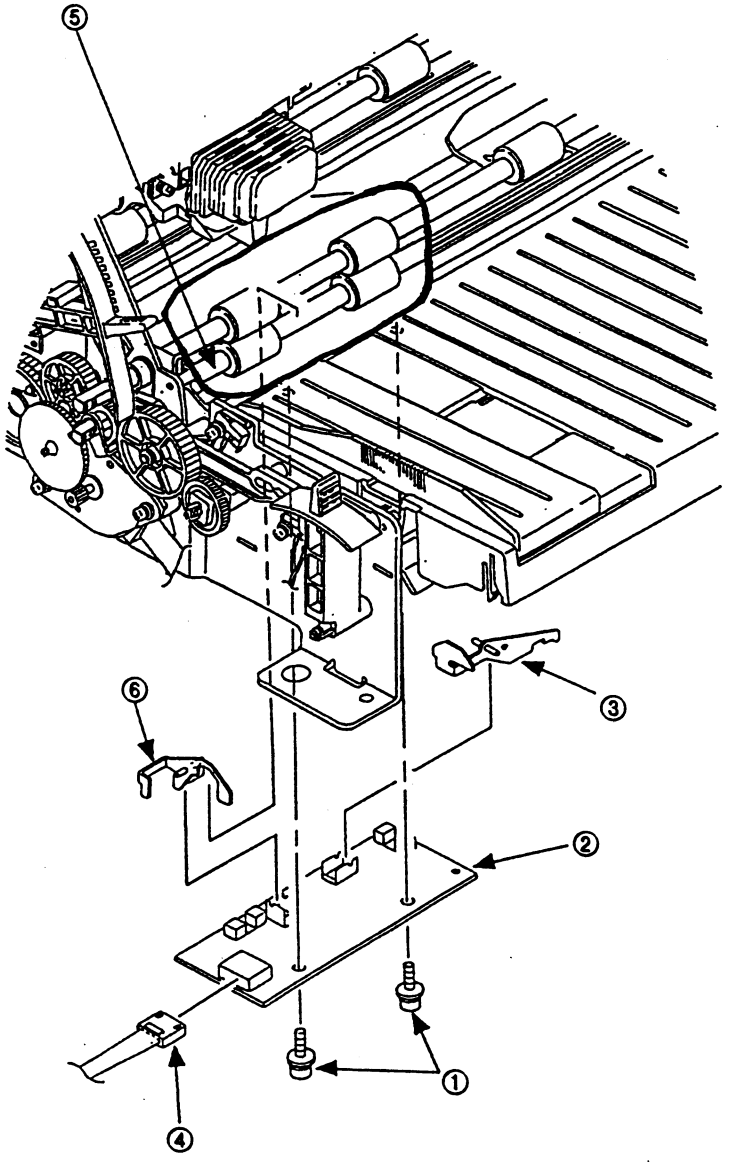
(3) Remove two screws ① to remove the SHPT-PCB ② and sensor arm A ③.

(4) Remove the sensor arm B ⑥ while paying attention to the feed roller shaft ⑤.

(5) Remove the cable ④ from the SHPT-PCB ②.

[Notes on reassembly]

- *Before reinstalling the SHPT-PCB ②, check that the sensor arm A ③ and sensor arm B ⑥ move smoothly.*



4.3.6 Power supply board (power supply unit)

(1) Remove the upper cover assembly (see Section 4.3.1).

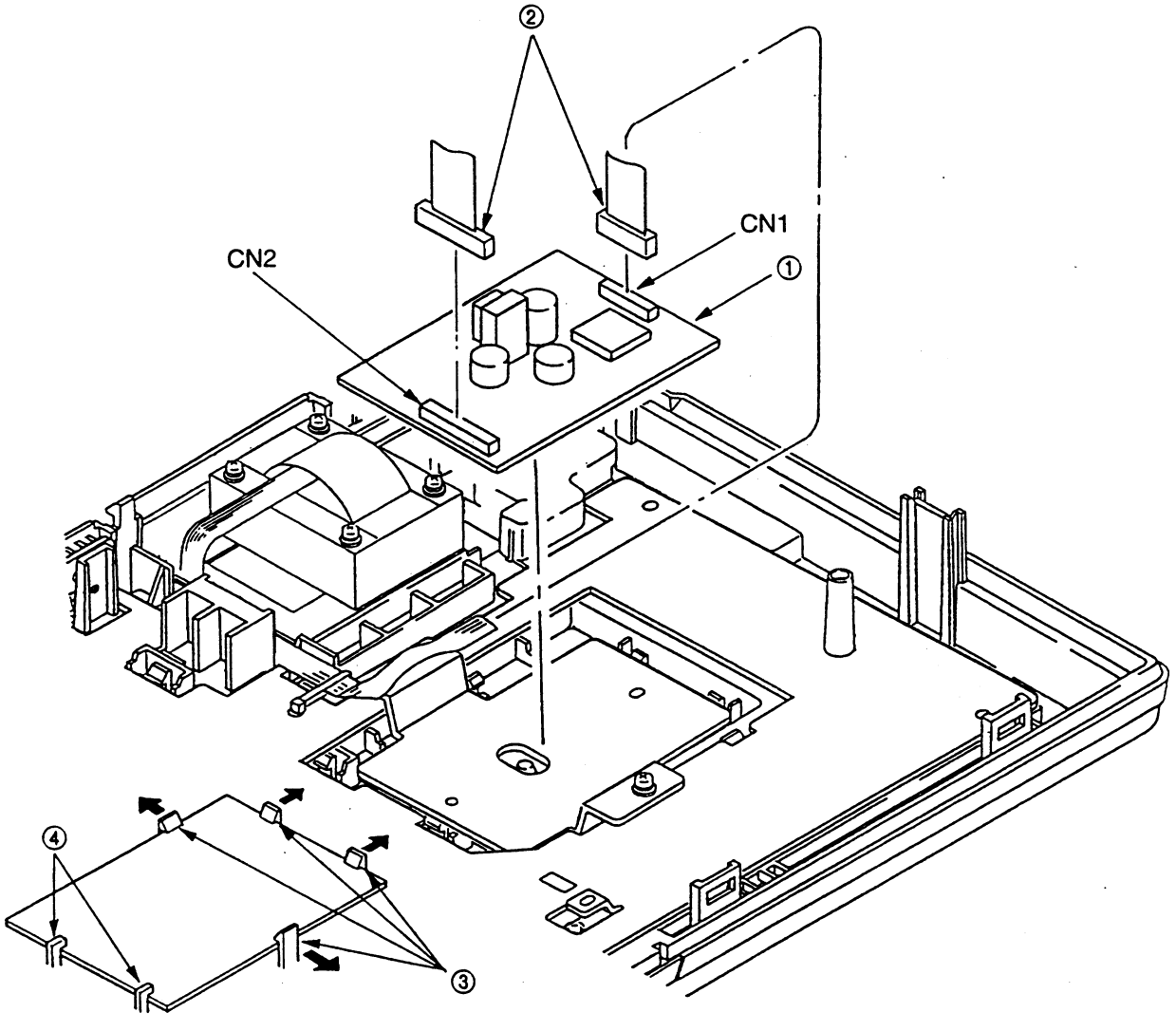
(2) Remove the printer unit (see Section 4.3.3).

(3) Remove the cable (CN1 and CN2) ② from the power supply board ①.

(4) Unlock four claws ③ to remove the power supply board ①.

[Notes on reassembly]

- *Make sure that the power supply board ① is locked firmly with four claws ③ and two guides ④.*



4.3.7 Transformer (power supply unit)

(1) Remove the upper cover assembly (see Section 4.3.1).

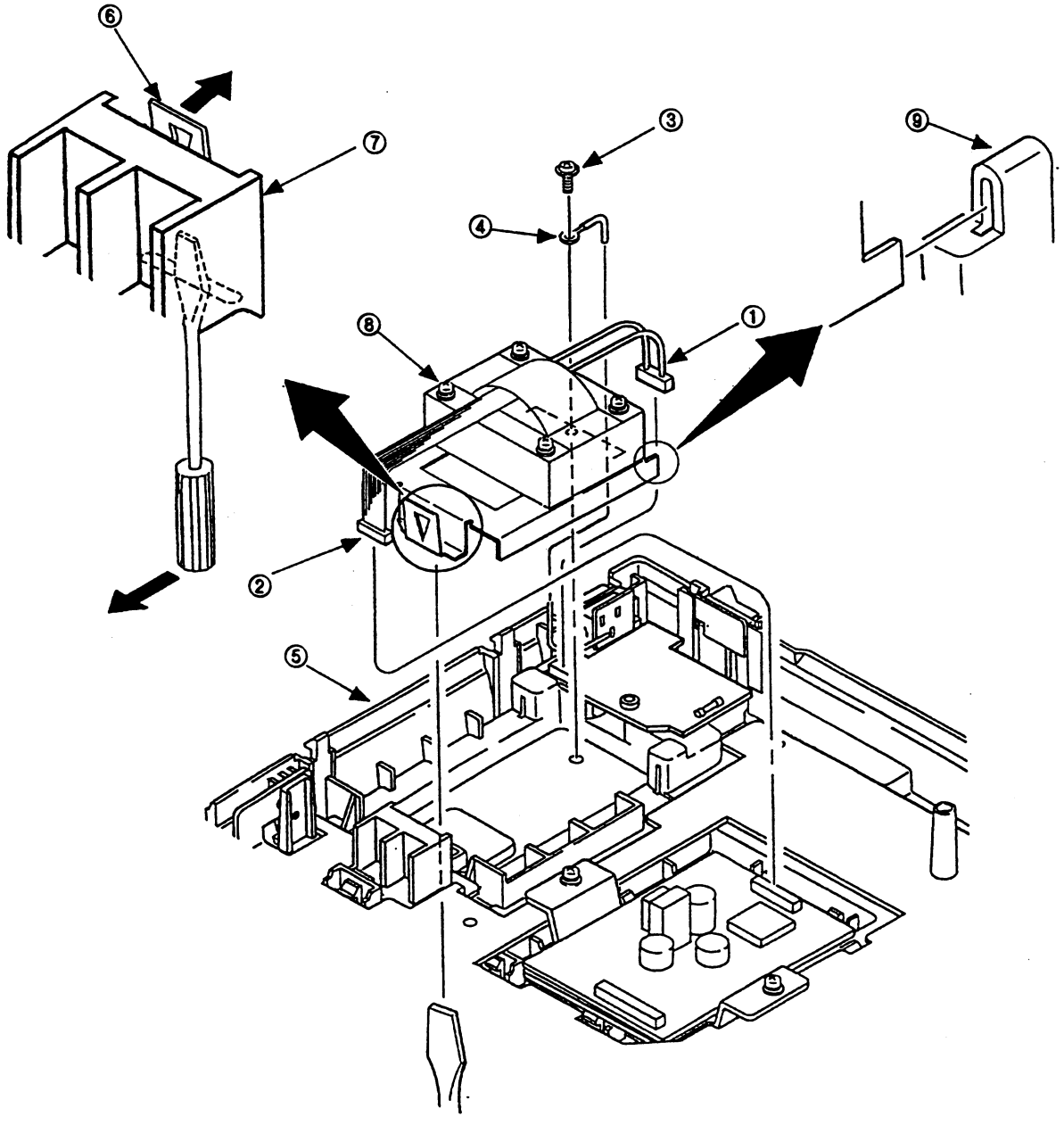
(2) Remove the printer unit (see Section 4.3.3).

(3) Remove the cable ① from the filter assembly and remove the cable ② from the power supply board.

(4) Remove the screw ③ to remove the ground wire ④.

(5) Insert the flat-blade screwdriver from the rear lower cover assembly ⑤ and push the lock spring ⑥ to the right to remove the transformer ⑧ from the transformer clamp A ⑦.

(6) Raise the left side of the transformer ⑧, slide out the transformer ⑧ from the transformer clamp B ⑨.



4.3.8 Filter assembly (power supply unit)

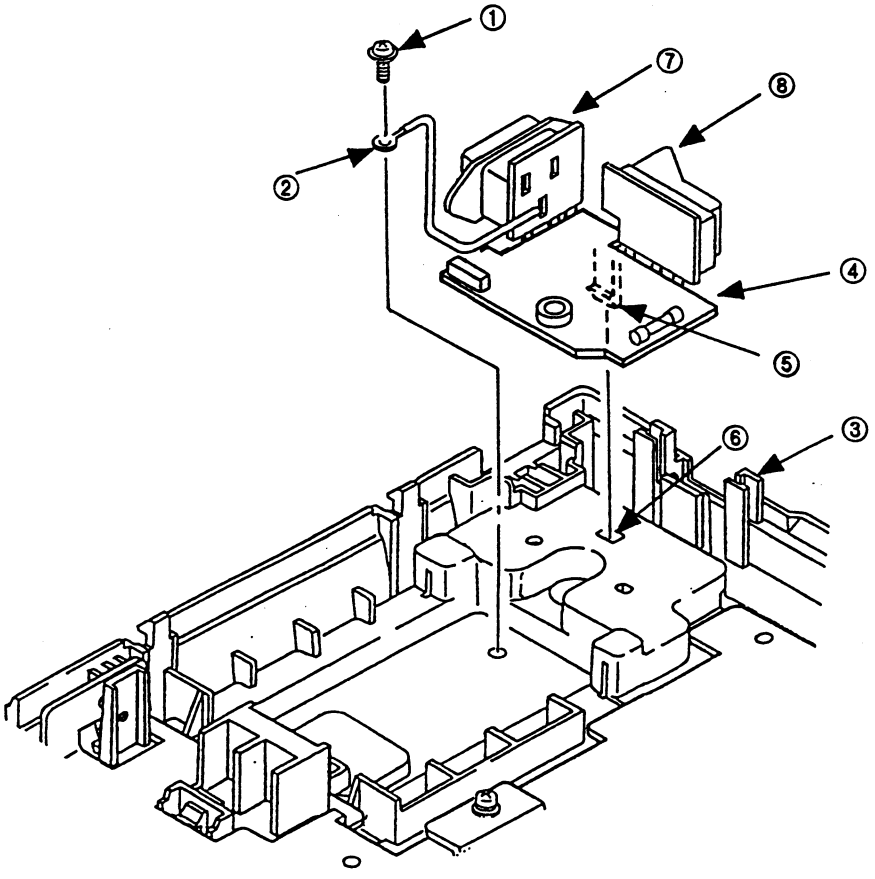
(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section4.3.3).

(3) Remove the screw ① to remove the ground wire ②.

(4) Reach the claw ⑤ of the filter assembly ④ from the rear lower cover assembly ③. Release the claw ⑤ from the locking position ⑥.

(5) Remove the AC inlet ⑦ and AC power switch ⑧ from the guide to remove the filter assembly ④.



4.3.9 LF pulse motor

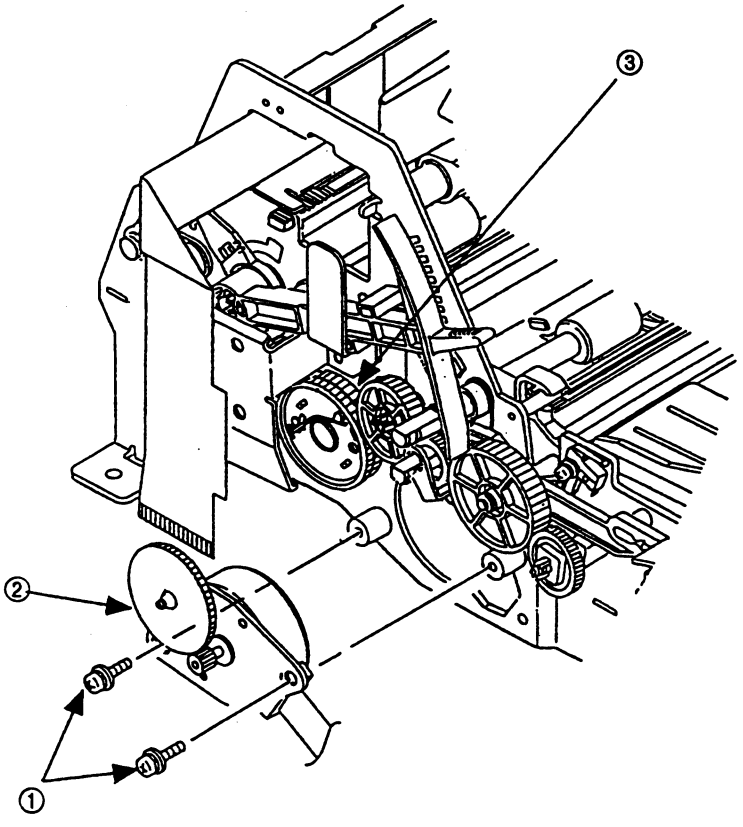
(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

(3) Remove two screws ① to remove the LF pulse motor ②.

[Notes on reassembly]

- *Lightly push the LF pulse motor ② towards the platen gear assembly ③ and fix it in place with the screws ①.*



4.3.10 Platen assembly

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

(3) Remove the SHPT-PCB (see Section 4.3.5).

(4) Remove the LF pulse motor (see Section 4.3.9).

(5) Remove screw ① to remove the cable guide ②.

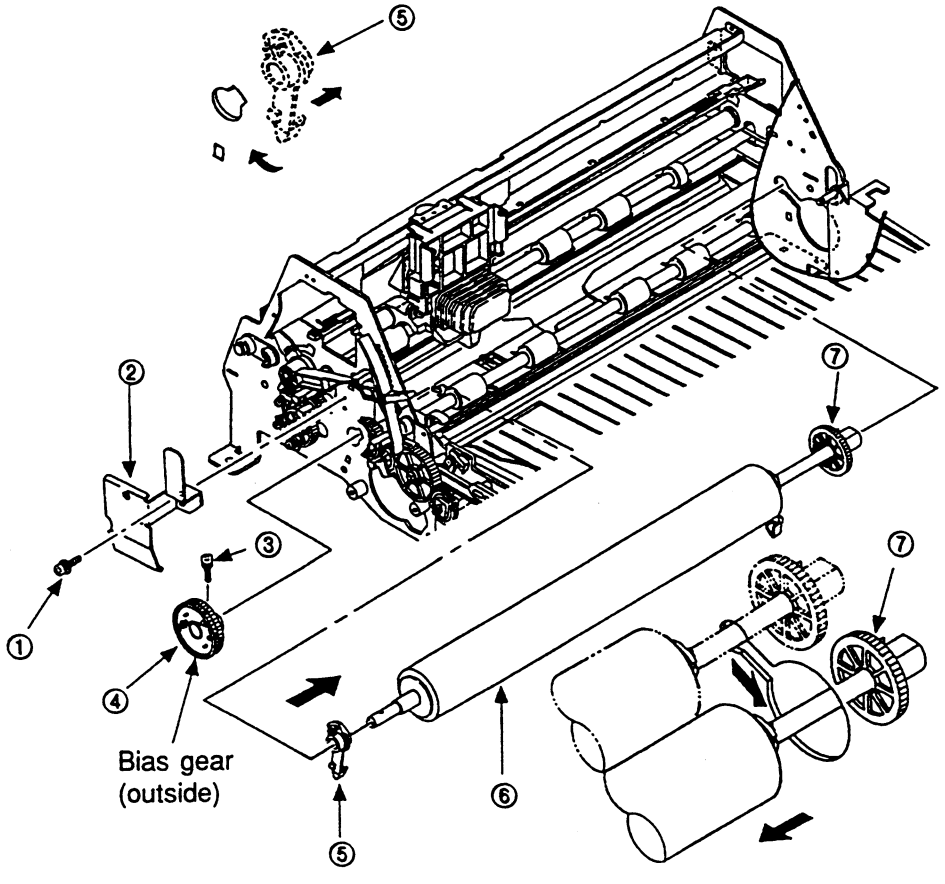
(6) Remove screw ③ to remove the platen gear assembly ④.

(7) Pull the knob of the platen collar ⑤ so that the protruding part matches the notch of the left side frame. Unlock by moving it inside.

(8) Slide the platen assembly ⑥ to the right and remove it from the left side frame. Move the platen assembly ⑥ towards you until the hole of the right side frame matches the platen gear ⑦. Move the platen assembly ⑥ further to the left to remove it from the right side frame.

[Notes on reassembly]

- *Be careful about the installation orientation of the platen collar ⑤.*
- *When the platen assembly ⑥ is installed, shift the bias gear of the platen gear assembly ④ half step clockwise to make it engage with the left and right gears.*
- *After installing the platen assembly ⑥, adjust the LF pulse motor backlash (see* Section 4.3.9*) and adjust the gap between the print head and the platen (see* Section 5.1*).*



4.3.11 Micro switch assembly

The micro switch assembly consists of three micro switches.

Replace the entire micro switch assembly.

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

(3) Cut the tie-wrap ① that fixes the switch cable ② to the left side frame ③.

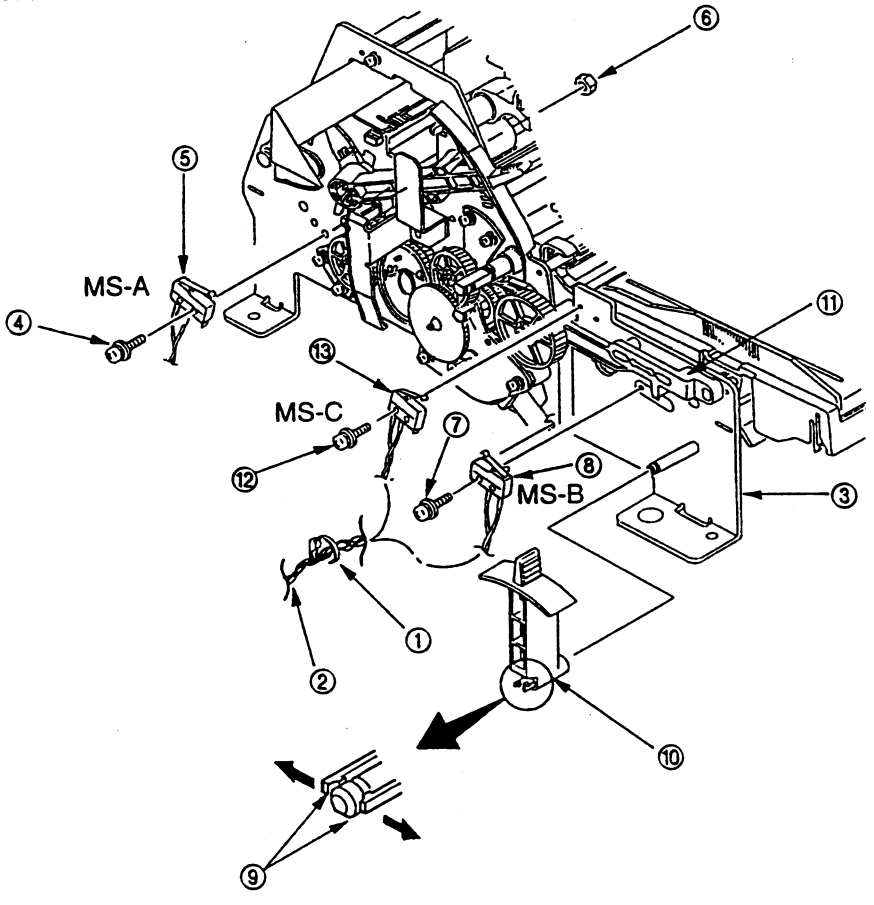
(4) Remove the micro switch A.
Remove screw ④ to remove the micro switch A ⑤ (be careful not to lose the nut ⑥ that comes off at the same time).

(5) Remove the micro switch B.
Remove screw ⑦ to remove the micro switch B ⑧.

(6) Remove the micro switch C.
i) Unlock the claw ⑨ to remove the paper release lever ⑩.
ii) Remove the change lever A ⑪ from the post and pull downward.
iii) Remove screw ⑫ to remove the micro switch C ⑬.

[Notes on reassembly]

- *After installing the micro switch A, adjust the position (see* Section 5.2*).*
- *When installing micro switches A, B, and C, be careful not to get them installed at wrong locations.*



4.3.12 Feed roller shaft

There are four feed roller shafts, two each on the front and the rear. Replacement procedures are described below.

- Front

  (1) Remove the upper cover assembly (see Section 4.3.1).

  (2) Remove the printer unit (see Section 4.3.3).

  (3) Remove screw ① to remove the feed roller spring A ②.

  (4) Remove screw ③ to remove the feed roller spring B ④.

  (5) Remove screw ⑤ to remove the feed roller spring C ⑥ (be careful not to lose the pressure roller piece ⑦ that comes off at the same time).

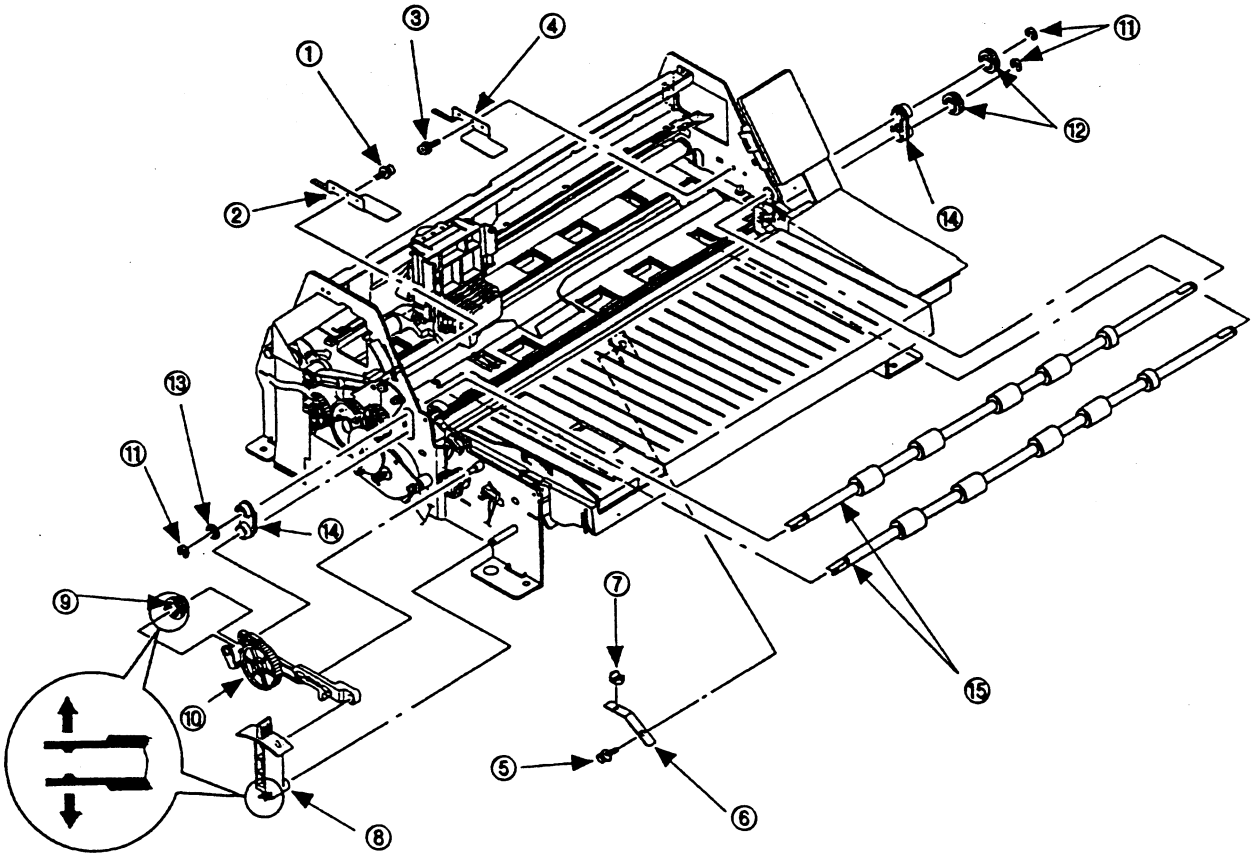
  (6) Remove the SHPT PCB (see Section 4.3.5).

  (7) Unlock the claw, then remove the change lever ⑧.

  (8) Unlock the claw of the LF gear ⑨, then remove the change gear bracket assembly ⑩.

  (9) Remove three E-clips ⑪, two LF knob gears ⑫ (Right), flange ⑬ (Left), and two LF bushes ⑭ (Left and Right).

  (10) Remove the two feed roller shafts ⑮.



- Rear

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the printer unit (see Section 4.3.3).

(3) Remove screw ① to remove the feed roller spring A ②.

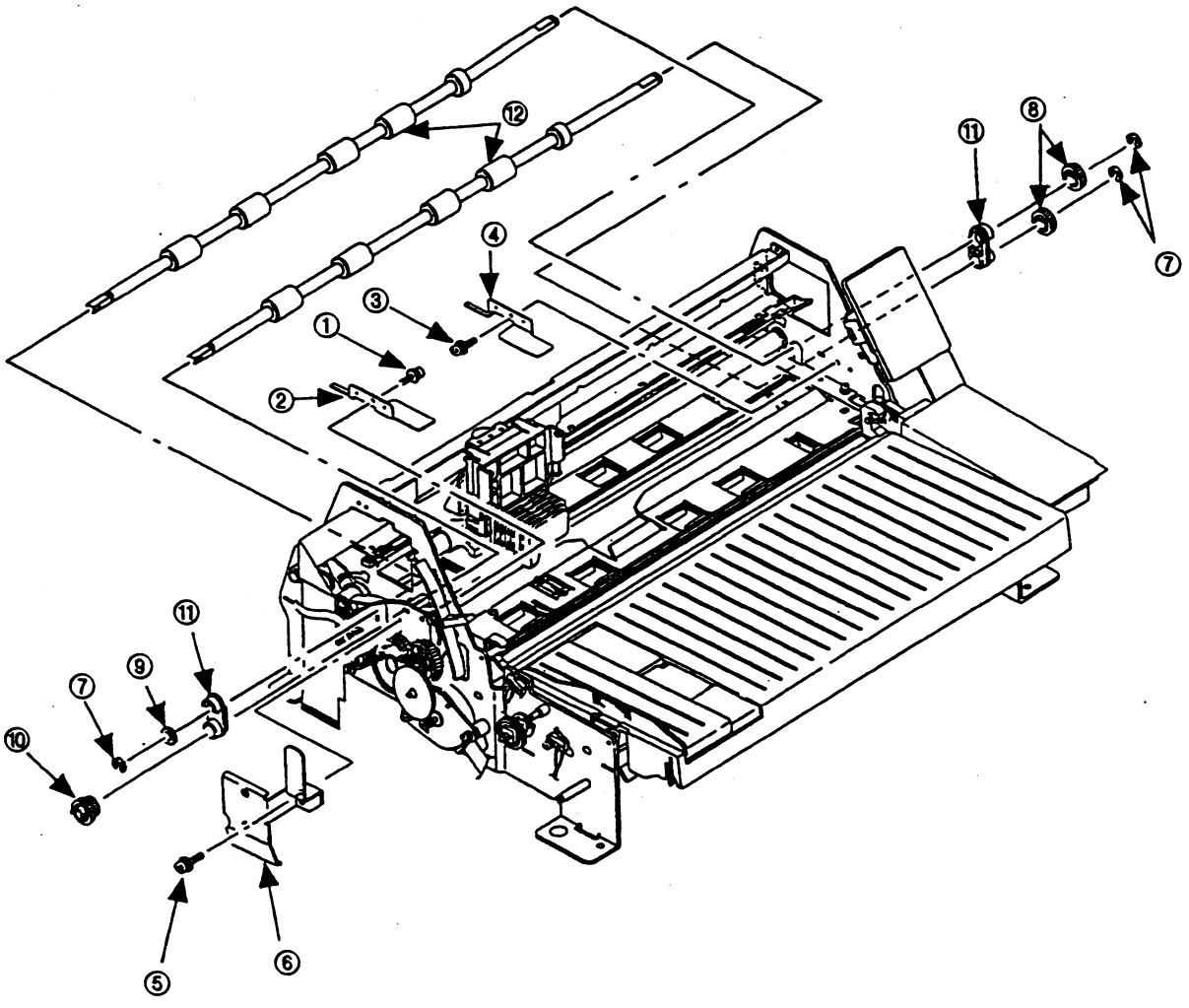
(4) Remove screw ③ to remove the feed roller spring B ④.

(5) Remove screw ⑤ to remove the cable guide ⑥.

(6) Remove three E-clips ⑦, two LF knob gears ⑧ (Right), and flange ⑨ (Left).

(7) Remove the LF gear ⑩ (Left) and two LF bushes ⑪.

(8) Remove the two feed roller shafts ⑫.



4.3.13 SHPO-2-PCB (operator panel)

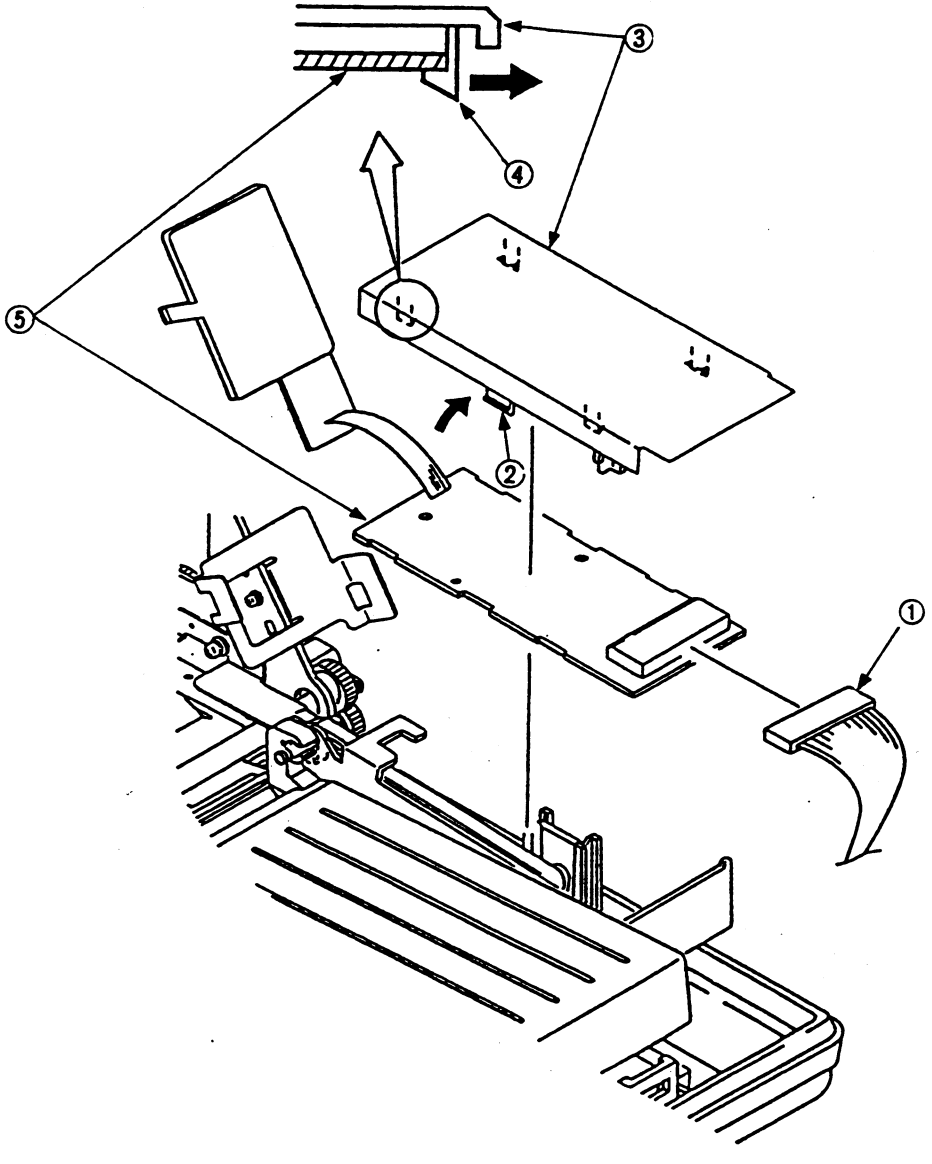
(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the cable ① and lift up the operator panel assembly ③, while pressing the claw ②.

(3) Unlock four claws ④ to remove the SHPO-2-PCB ⑤.

[Notes on installation]

- *Lock the SHPO-2-PCB ⑤ firmly in place with four claws ④.*



4.3.14 Left and right tractor assemblies

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Lower the paper release lever ① to open the table assembly ②.

(3) Remove the sheet guide ③ to remove the E-clip ④.

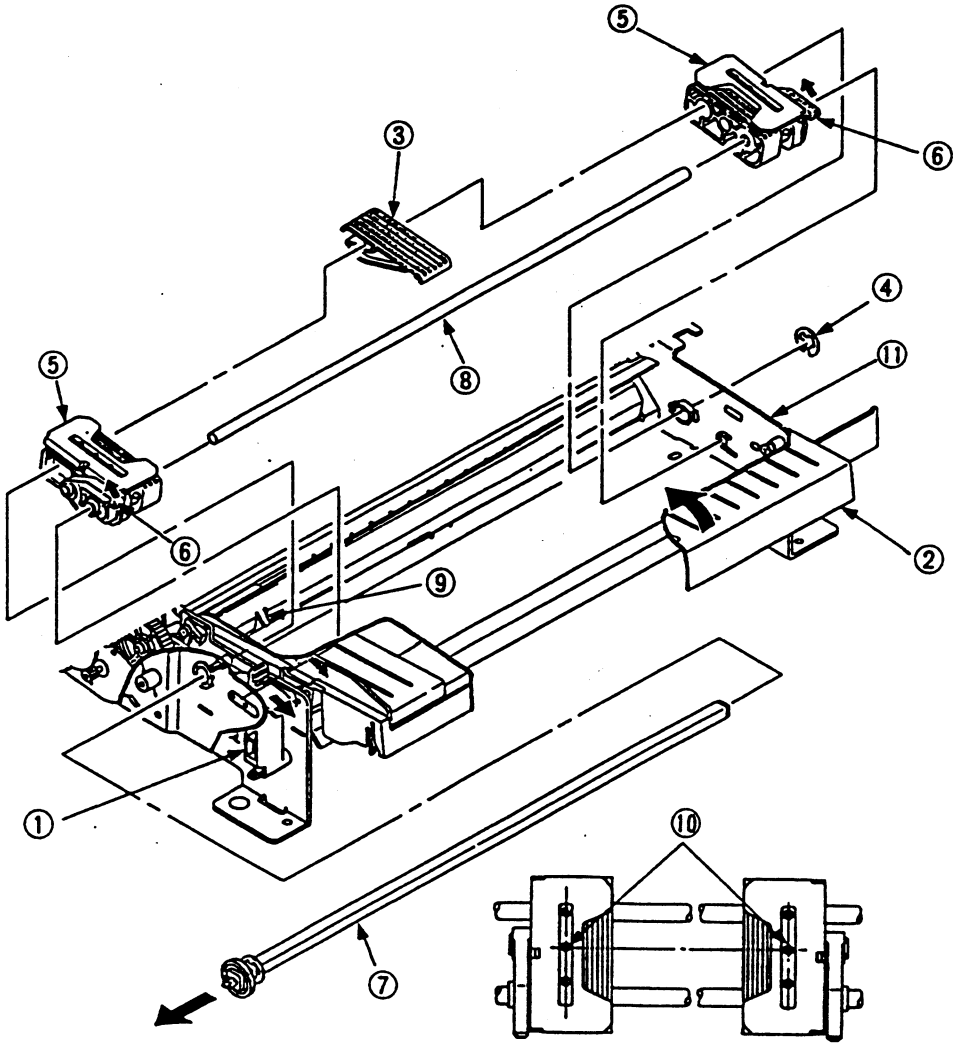
(4) Raise (unlock) the lock lever ⑥ of the left and right tractor assemblies ⑤. Slide out the tractor shaft ⑦ to the left.

(5) Take out the left and right tractor assemblies ⑤ together with the tractor guide shaft ⑧.

(6) Detach the left and right tractor assemblies ⑤ from the tractor guide shaft ⑧.

[Notes on reassembly]

- *Reinstall the left tractor assembly further left than the bracket ⑨.*
- *When reinstalling the tractor shaft ⑦, match the left and right tractor assemblies ⑤ and the position of the sprocket-pin ⑩.*
- *Fit the tractor guide shaft ⑧ in the U-groove of the right side frame ⑪.*



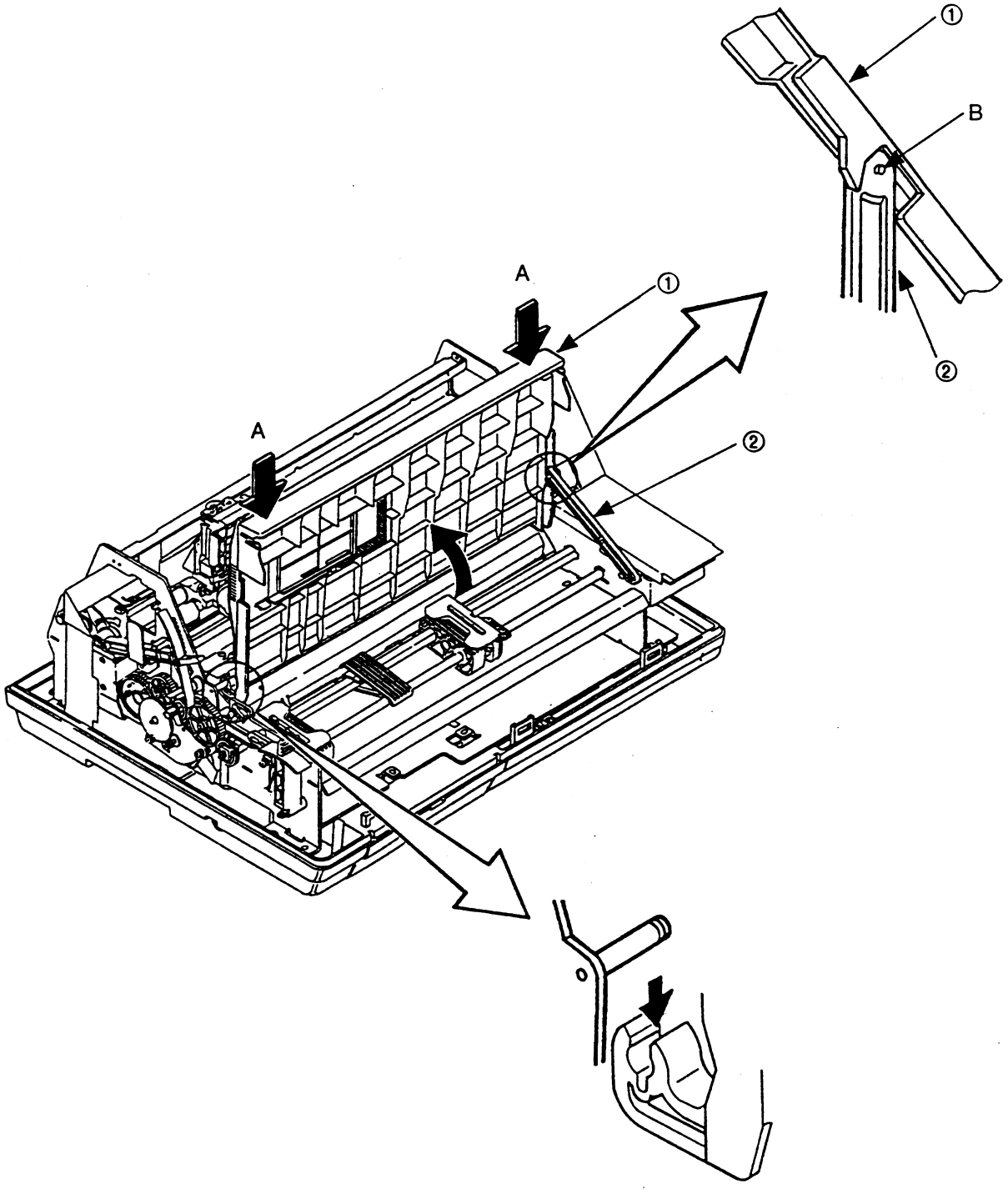
4.3.15 Table assembly

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Open the table assembly ①.

(3) Push section A (two locations on left and right) until the fulcrum is unlocked.

(4) Remove the lock stay ② from the fulcrum B of the table assembly ①, then disengage the table assembly ①.



4.3.16 Feed roller spring A and B

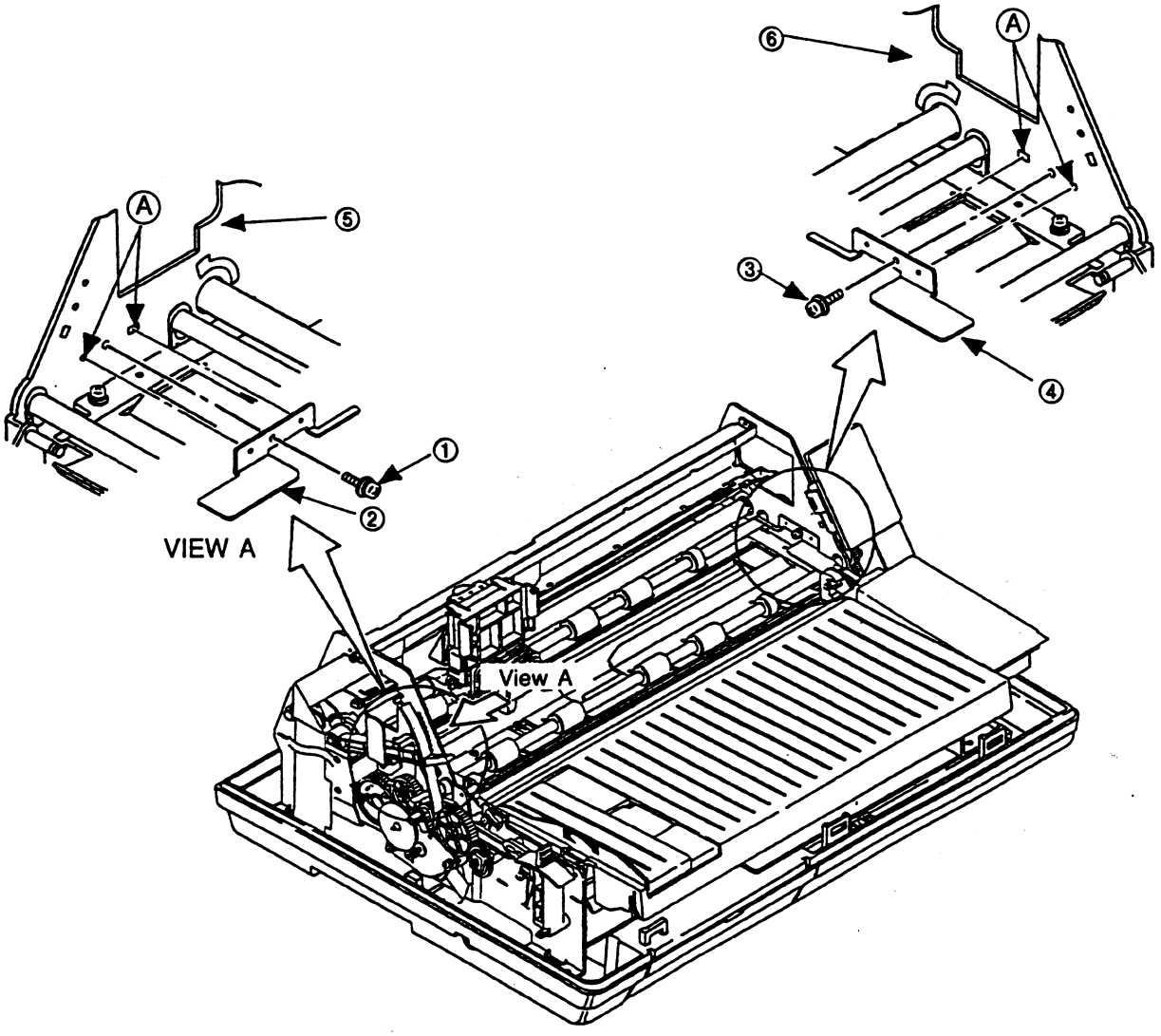
(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove screw ①, then remove the feed roller spring A ②.

(3) Remove screw ③, then remove the feed roller spring B ④.

[Notes on reassembly]

- *Ensure that the feed roller springs A ② and B ④ are placed firmly into holes Ⓐ of the side frames ⑤ and ⑥, then fix them in place with screws ① and ③.*



4.3.17 Stacker shaft

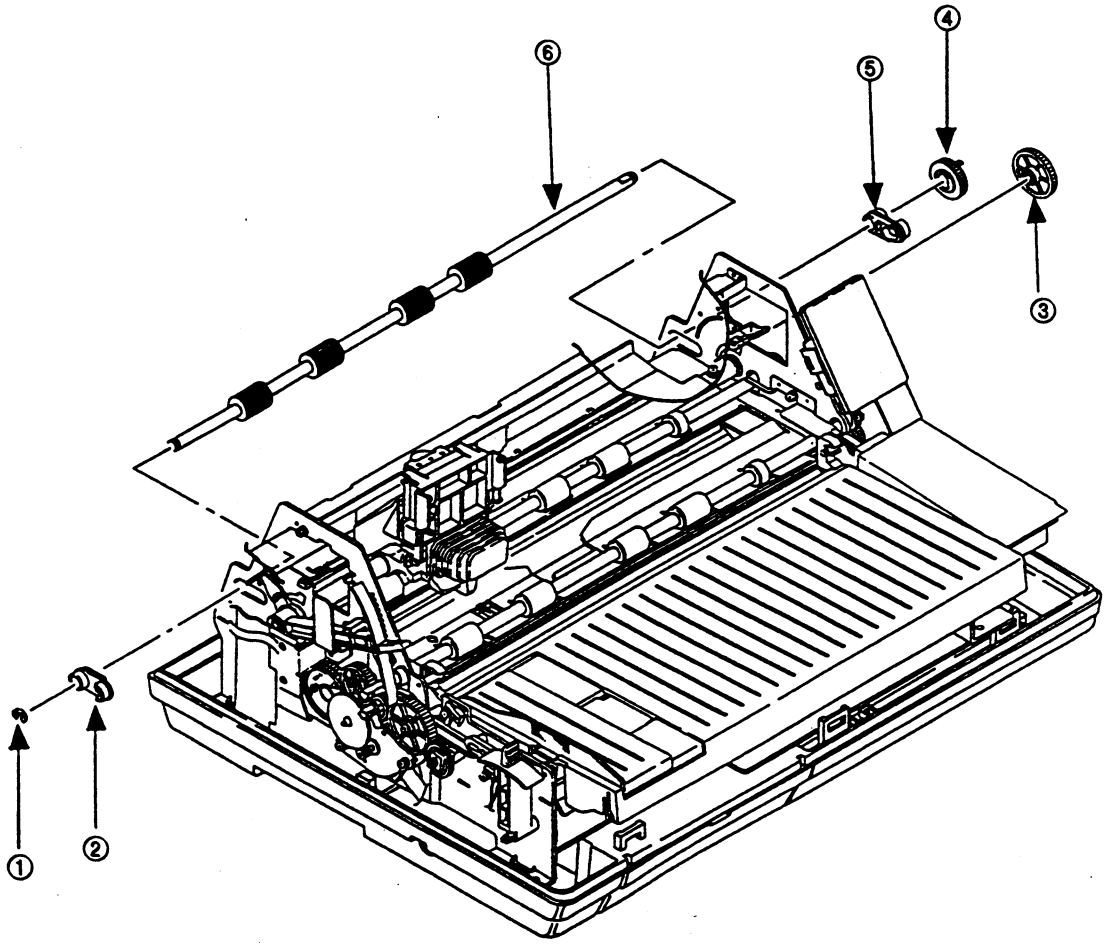
(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove E-clip ①, then remove the LF bush ②.

(3) Remove the idle gear B ③ (rear).

(4) Remove the stacker gear L ④, then remove the LF bush ⑤.

(5) Remove the stacker shaft ⑥.



4.3.18 Print head

[Note] *The print head is excessively hot immediately after printing. Wait until the print head cools or use a protector to replace the printer head.*

(1) Lift the adjusting lever ① to open the access cover ②.

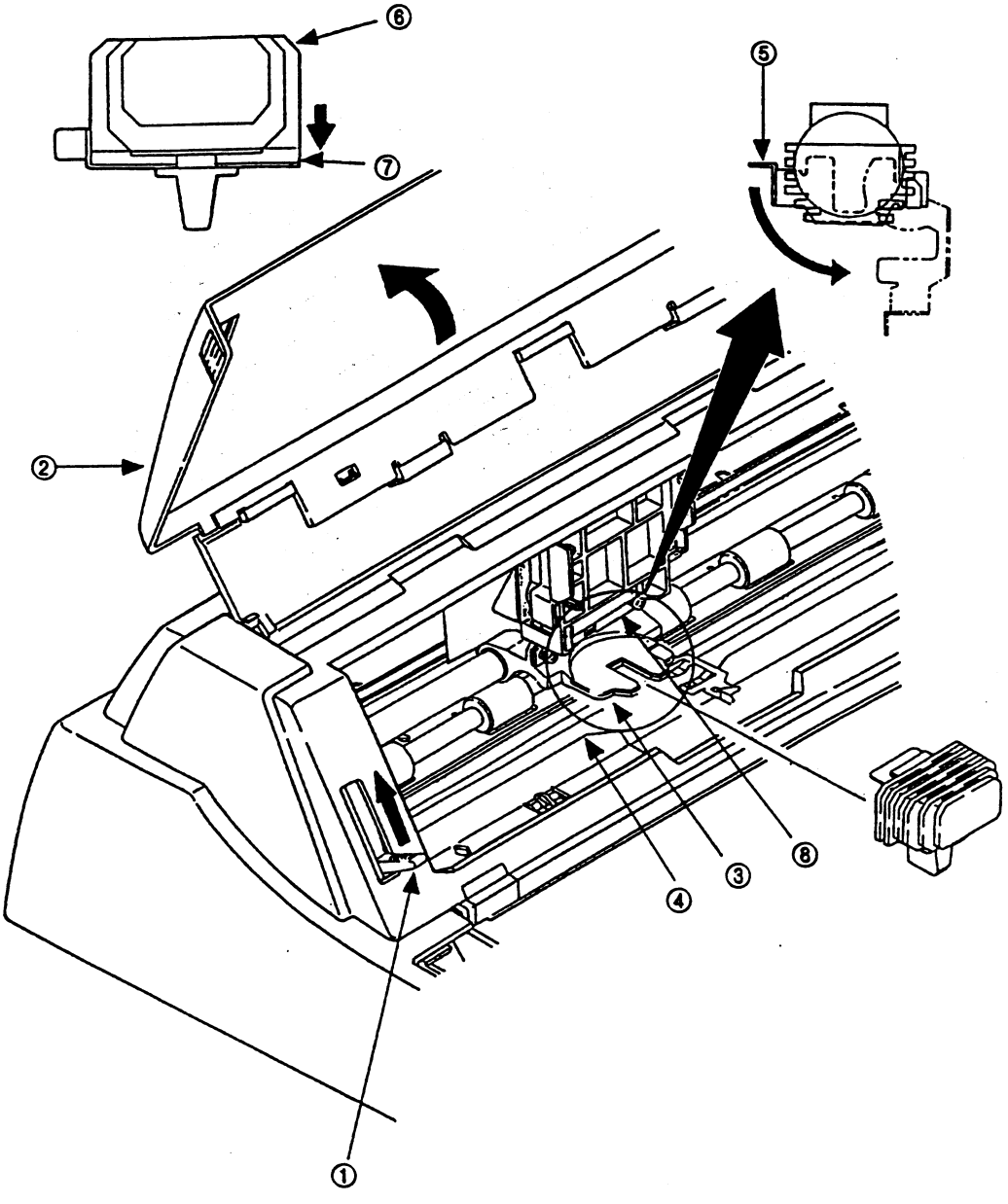
(2) Move the carriage unit ③ to the center of the notch of the upper sheet guide ④.

(3) Slide the head clamp ⑤ towards you and unlock the print head ⑥.

(4) Slide the print head ⑥ towards you to remove it.

[Notes on reassembly]

- *Connect the connector ⑧ while pressing the print head ⑥ against the carriage frame ⑦.*
- *Lock the head clamp ⑤ firmly in place between the print head ⑥ and the carriage frame ⑦.*



4.3.19 Ribbon feed gear assembly

(1) Remove the upper cover assembly (see Section 4.3.1).

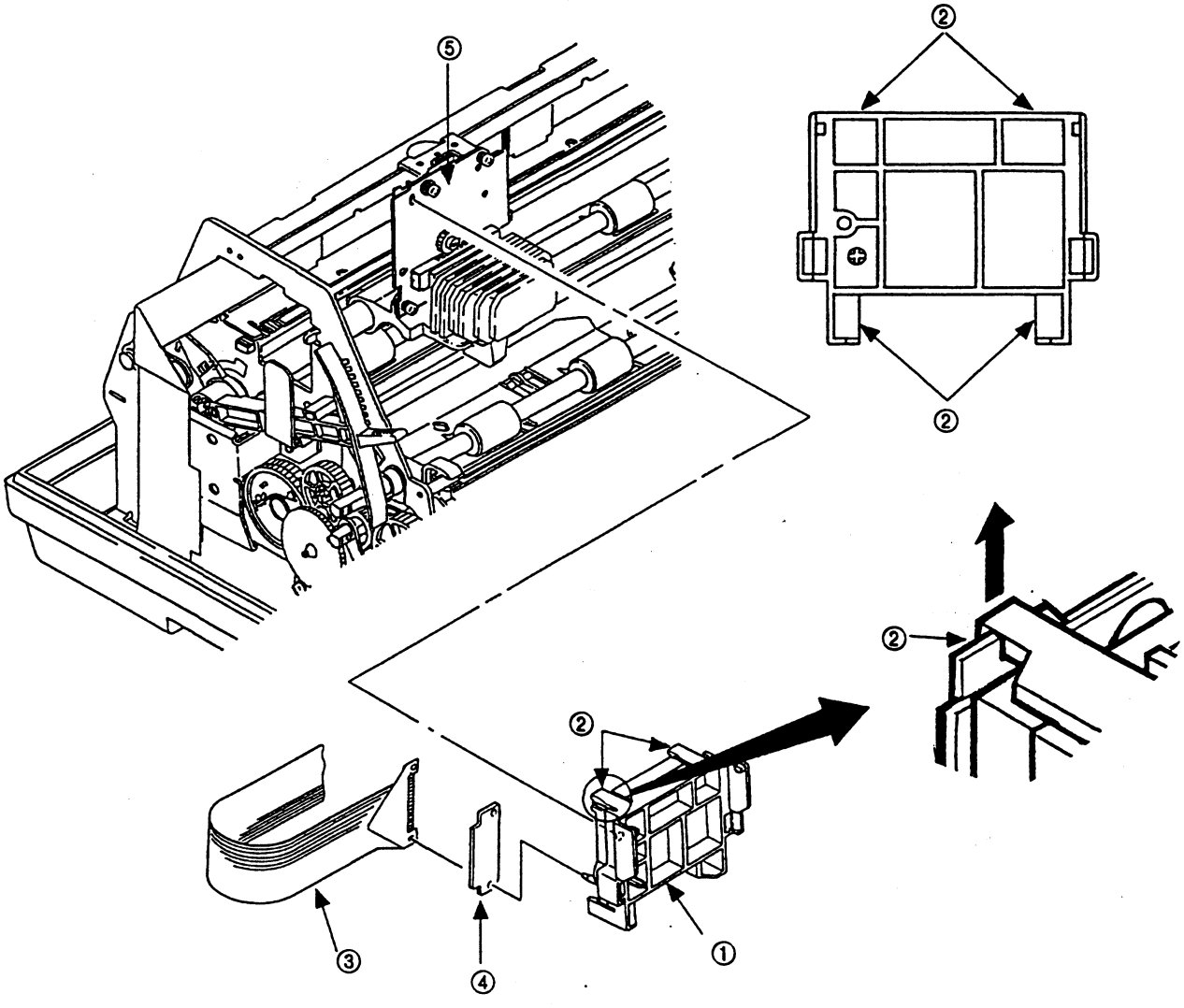
(2) Remove the print head (see Section 4.3.18).

(3) Unlock four claws ② and remove ribbon feed gear assembly ① while sliding it towards you (insert the flat-blade screwdriver into the hole to disengage the claw).

(4) Remove the head cable ③, and contact pressure rubber ④ from the ribbon feed gear assembly ①.

[Notes on reassembly]

- *Do not touch the uncovered terminal (pressure welding point) of the space motor assembly ⑤ and head cable ③. Also, do not allow any dust to come in contact with the uncovered terminal and head cable.*
- *Handle the head cable ③ carefully so that no creases are made.*



4.3.20 Space motor assembly

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the print head (see Section 4.3.18).

(3) Remove the ribbon feed gear assembly (see Section 4.3.19).

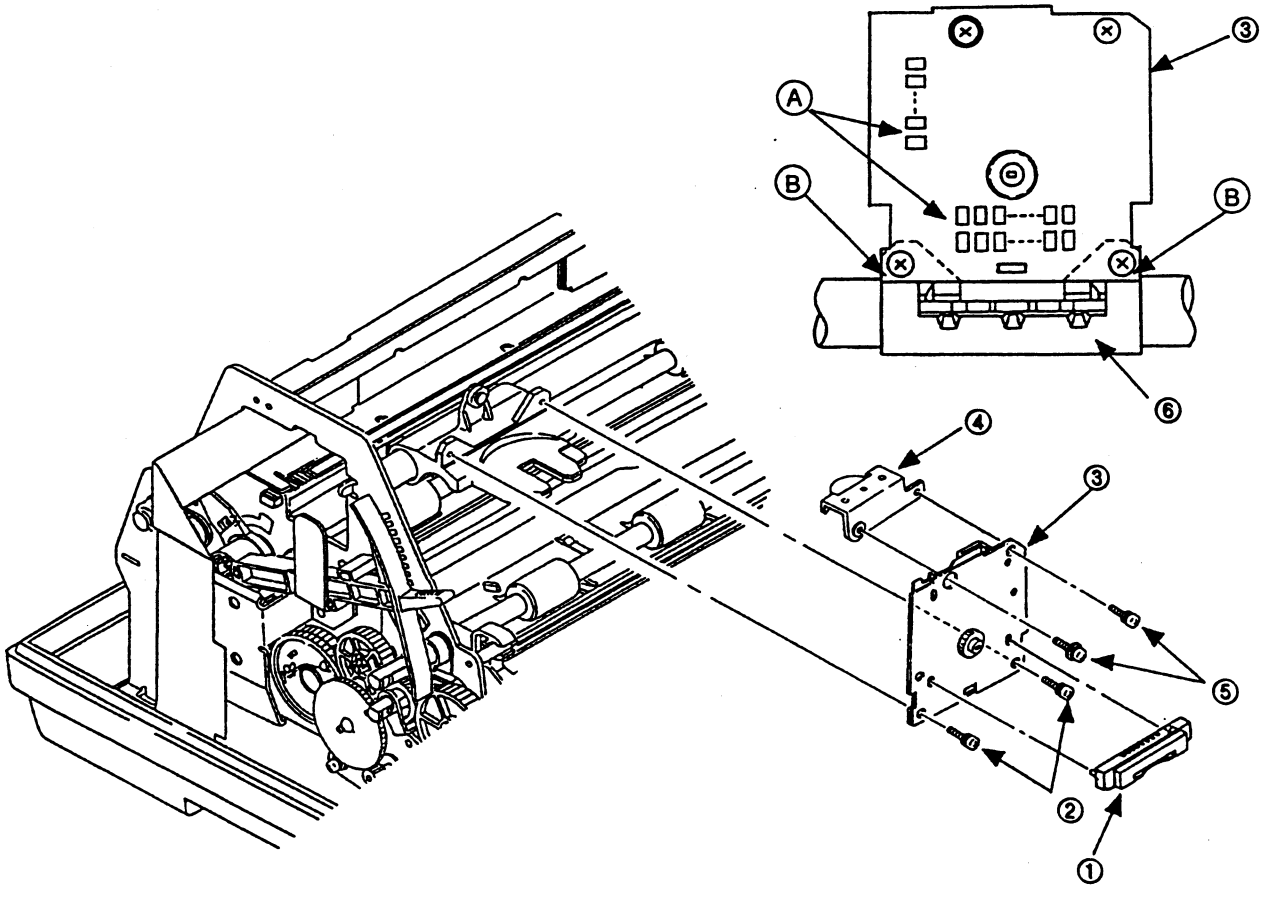
(4) Remove the connector ①.

(5) Remove two screws ② to remove the space motor assembly ③ together with the guide roller assembly ④.

(6) Remove two screws ⑤ to remove the guide roller assembly ④.

[Notes on reassembly]

- *Do not touch the uncovered terminal (pressure welding point)Ⓐ of the space motor assembly ③. Also, do not allow any dust to come in contact with the uncovered terminal.*
- *When installing the space motor assembly ③, make sure that its part Ⓑ touches the carriage frame ⑥.*
- *After installing the space motor assembly, adjust the gap of the print head (see Section 5.1).*



4.3.21 Head cable

(1) Remove the upper cover assembly (see Section 4.3.1).

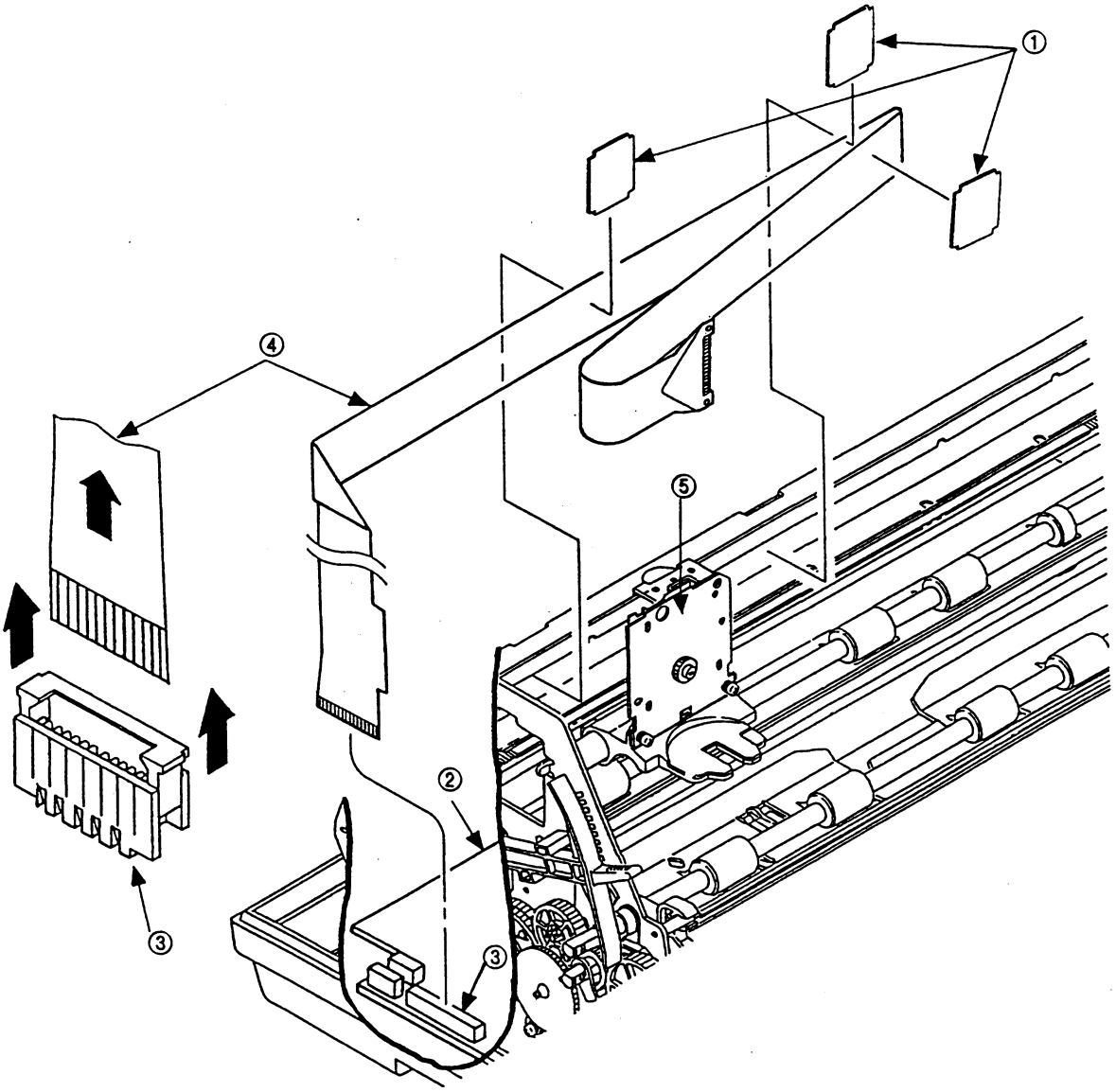
(2) Remove the ribbon feed gear assembly (see Section 4.3.19).

(3) Remove three guide plates ①.

(4) Unlock the connector (CN8) ③ of the SHPQ-PCB ② to remove the head cable ④.

[Notes on reassembly]

- *Do not touch the uncovered terminal (pressure welding point) of the head cable ④ and the space motor assembly ⑤. Also, do not allow any dust to come in contact with the head cable and the uncovered terminal.*
- *Handle the head cable ④ carefully so that no creases are made.*



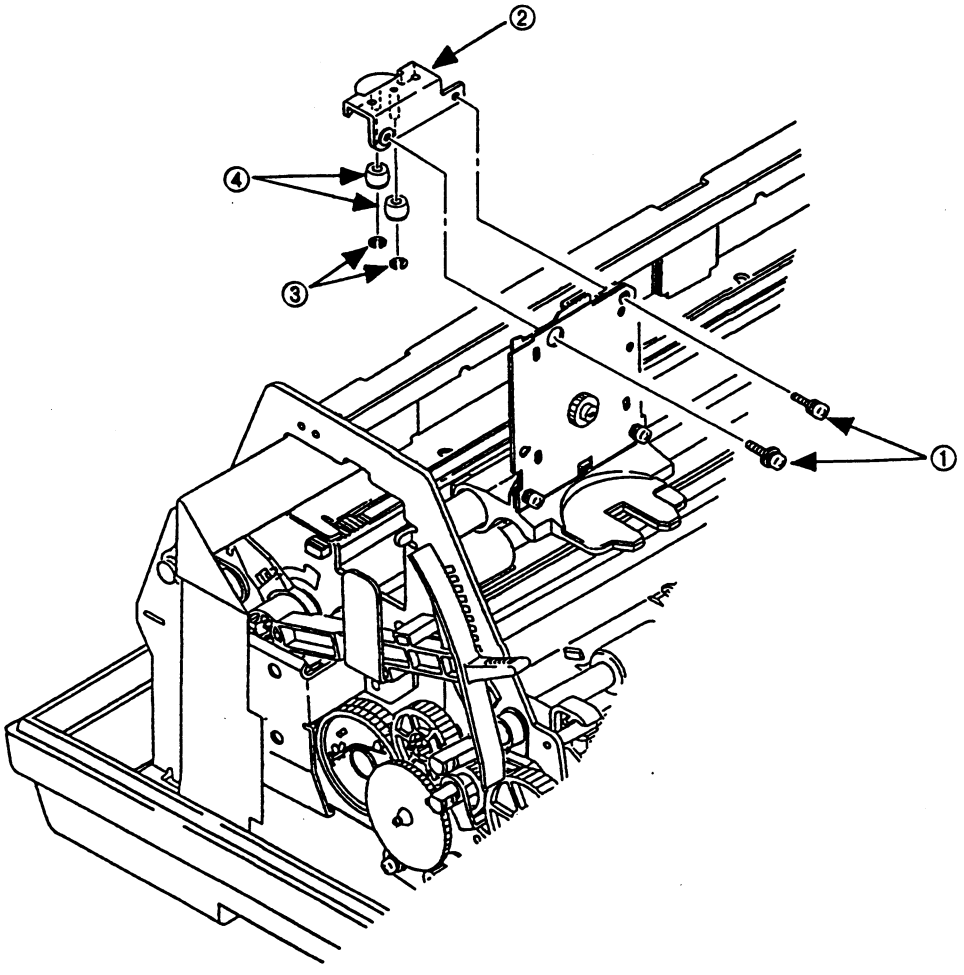
4.3.22 Guide roller

(1) Remove the upper cover assembly (see Section 4.3.1).

(2) Remove the ribbon feed gear assembly (see Section 4.3.19).

(3) Remove two screws ① to remove the guide roller assembly ②.

(4) Remove the E-clip ③ to remove the guide roller ④.



5. ADJUSTMENT

5. ADJUSTMENT

5.1 Gaps between Platen and Print Heads

[Note] *Set the adjustment lever to range 1 before checking adjustment.*

(1) Adjustment value : 0.018 ± 0.002" (0.45 ± 0.05 mm)

(2) Adjustment positions : The left end, center, and right end of the platen

(3) Adjustment method : Rotate the left and right adjustment bushings.

[Adjustment procedure]

a. Set the adjustment lever to range 1.

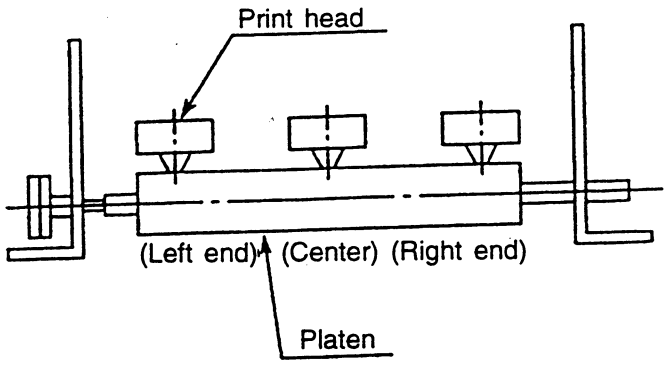
b. Set the left and right adjustment bushings to the initial position (marking).

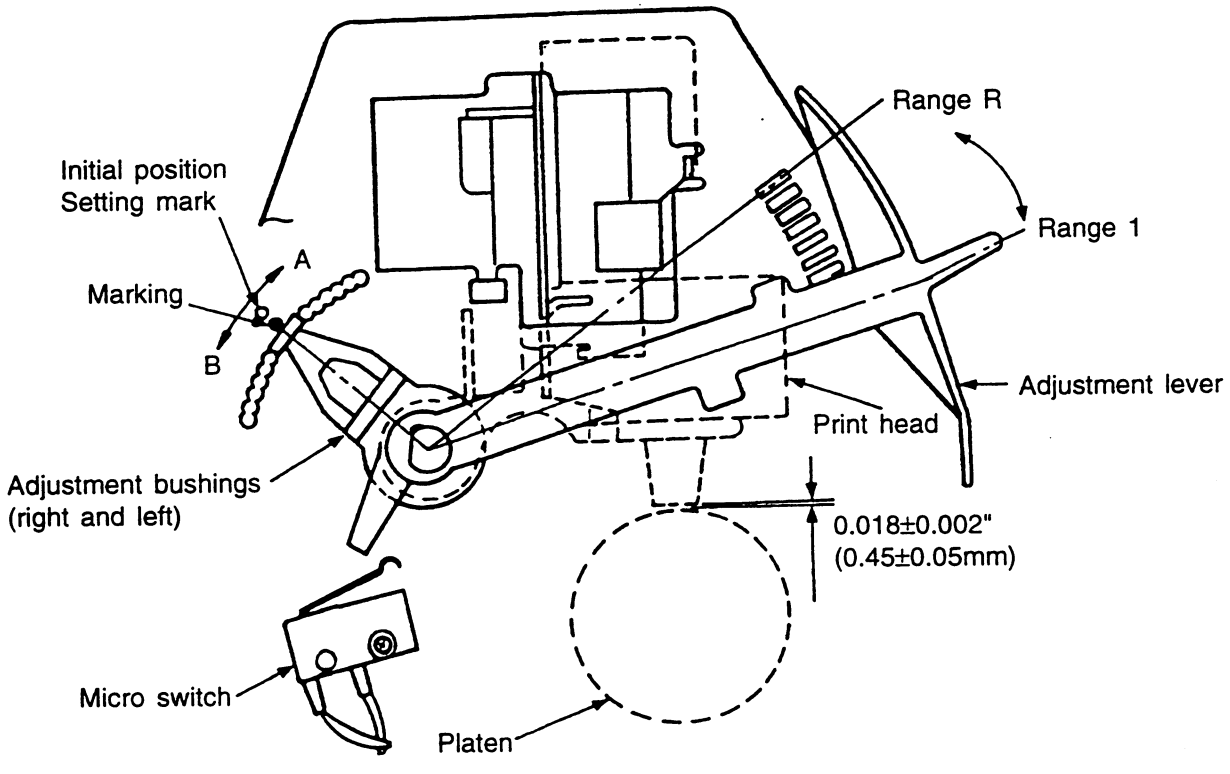
c. Put the adjustment lever to the left side frame (make sure there is no play between the adjustment lever and the groove).

d. While maintaining the condition described in C above, slide the adjustment bushings in the A or B direction.

e. Confirm that the adjustment lever is set to range R and the gap is 0.033 ± 0.002" (0.85 ± 0.05 mm).

[Note] *Adjust the gaps at the left end, center, and right end of the platen.*





5.2 Micro Switch Position

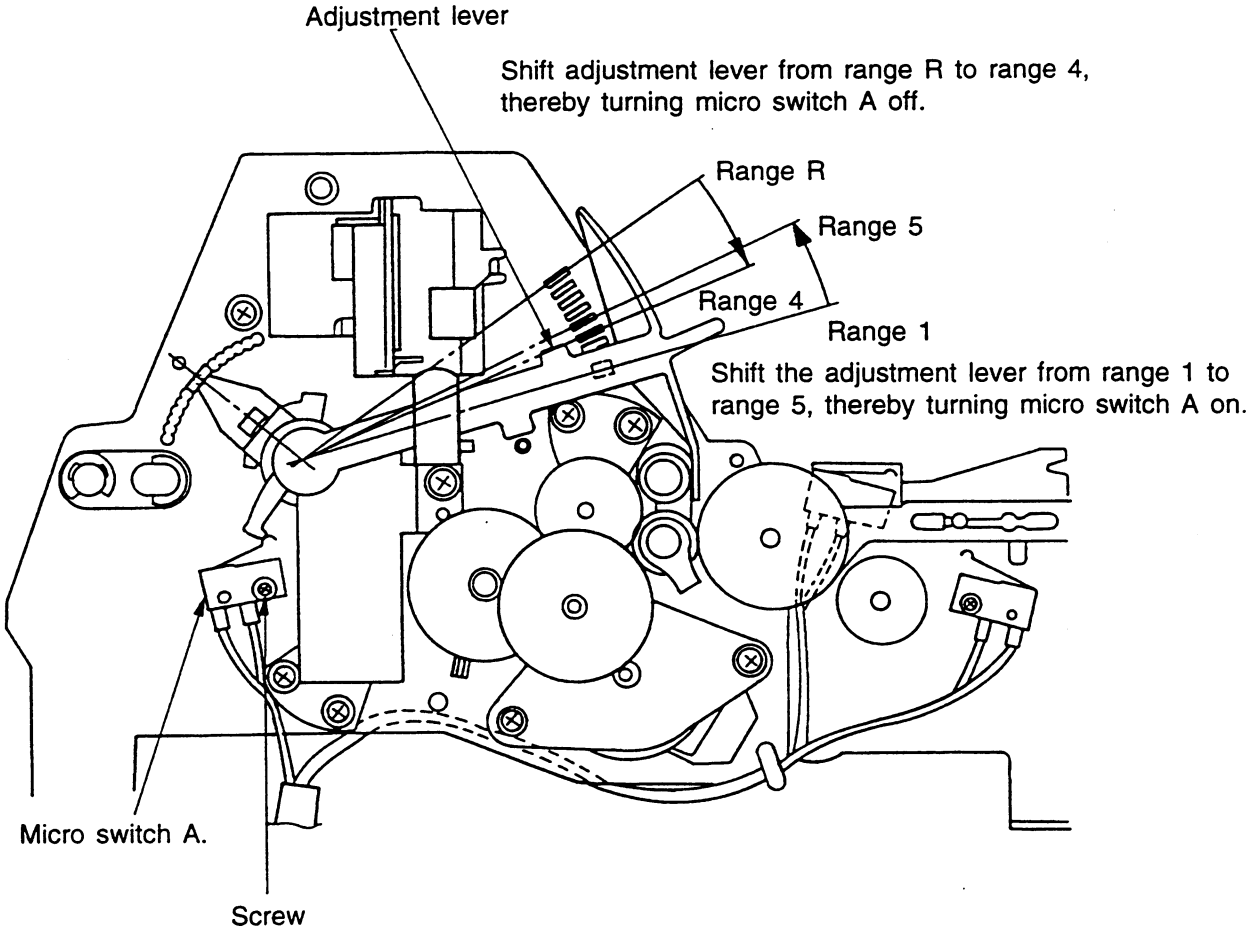
[Note] *Micro switch A is to be adjusted.*

(1) Adjustment value

- When the adjustment lever is shifted from range 1 to range 5, micro switch A is turned on.
- When the adjustment lever is shifted from range R to range 4, micro switch A is turned off.

(2) Adjustment method

Position micro switch A by loosening the screw.


Adjustment lever
Shift adjustment lever from range R to range 4, thereby turning micro switch A off.
Range R
Range 5
Range 4
Range 1
Shift the adjustment lever from range 1 to range 5, thereby turning micro switch A on.
Micro switch A.
Screw

6. CLEANING AND LUBRICATION

6. CLEANING AND LUBRICATION

6.1 Cleaning

[Notes for cleaning]

- *Before attempting to clean the printer, turn the POWER switch off.*
- *Be careful so that no paper dust enter inside mechanical components.*

[Area to be cleaned and cleaning period]

Follow the guidelines to clean the printer at the specified intervals.

- Cleaning period: Every six months or 300 operation hours, whichever comes first
- Required time: About ten minutes
- Tools to be used: Dry soft cloth (such as gauze, etc.) and vacuum cleaner (preferable)
- Cleaning area:

Table 6-1 Areas to be cleaned

Area to be cleaned	Contents of cleaning
Carriage shaft and its vicinity	Remove paper dust, and wipe off any dirt, dust, and ribbon fibers
Paper path	

6.2 Lubrication

(1) Lubricant

- Pan motor oil 10W-30 (or its equivalent) — PM
- Albania grease #2EP (or its equivalent) — GEP

(2) Amount of lubricant

- A lot —Ⓐ— Plenty of lubricant
- Medium —Ⓜ— About 3 to 4 drops. Alternatively, add a 0.008" (0.2 mm) layer of grease.
- Little —Ⓛ— About one drop
- Very little —Ⓥ Ⓛ— No blot on the parts surface.

(3) Period of lubricant

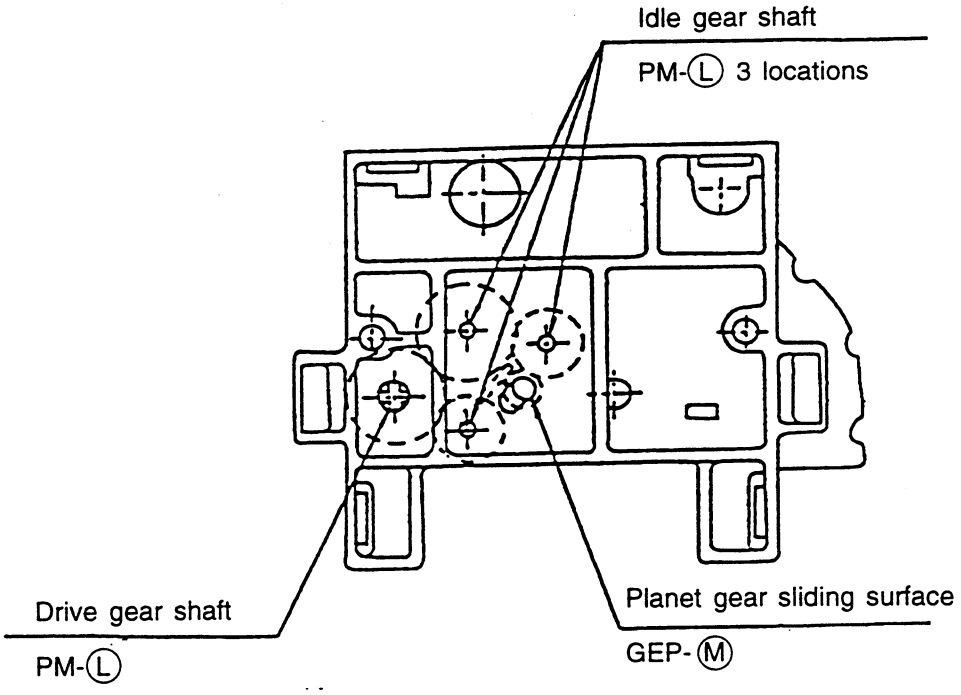
This equipment is designed to be maintenance-free and oiling is unnecessary during operation. However, when reassembly or cleaning of oiled parts occurs, lubrication is required.

(4) Areas to avoid contact with lubricant

Item No.	Areas to avoid lubricant	Reason	Remarks
1	Ink ribbon	To prevent print characters from blurring	
2	Platen surface	To prevent paper from getting dirty	
3	Feed roller surface	To prevent paper from getting dirty	
4	Flexible cable	To prevent poor contact and cracks	
5	Motor board	To prevent poor contact	
6	Carriage shaft	To stabilize the load of carriage feeding	
7	Sensor	To prevent dust accumulation	
8	Micro switch	To prevent dust accumulation	
9	Stacker roller surface	To prevent paper from getting dirty	
10	Pin tractor	To prevent paper from getting dirty	
11	Printhead	To prevent printhead failures	

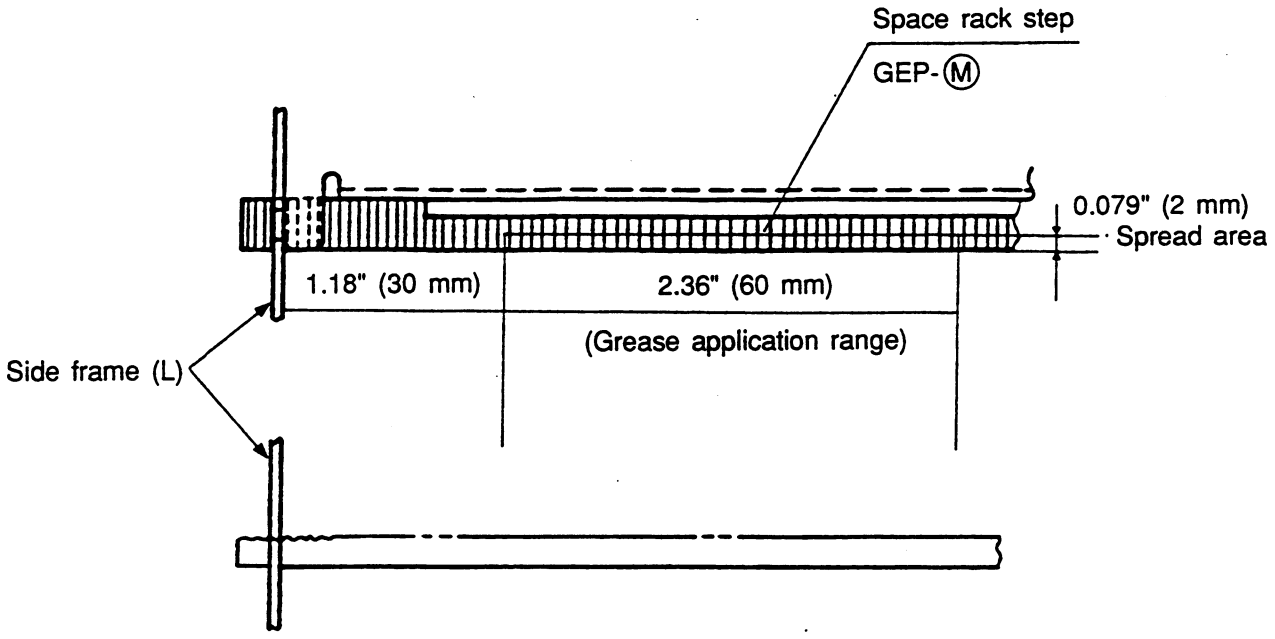
(5) Lubrication points

a) Ribbon drive gear assembly

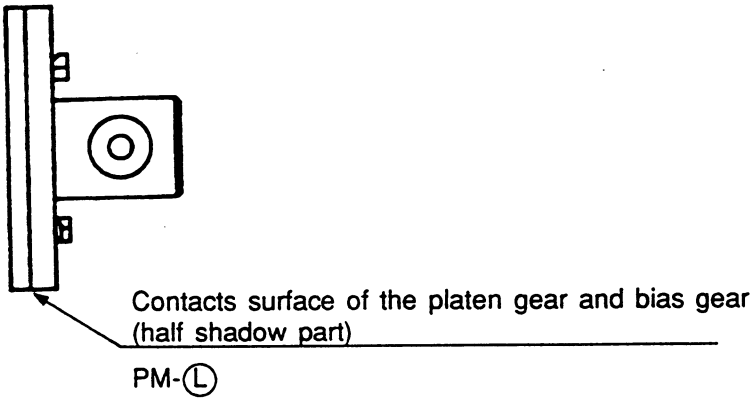


[Note] *The upper and lower ends of the gear shaft should be oiled.*

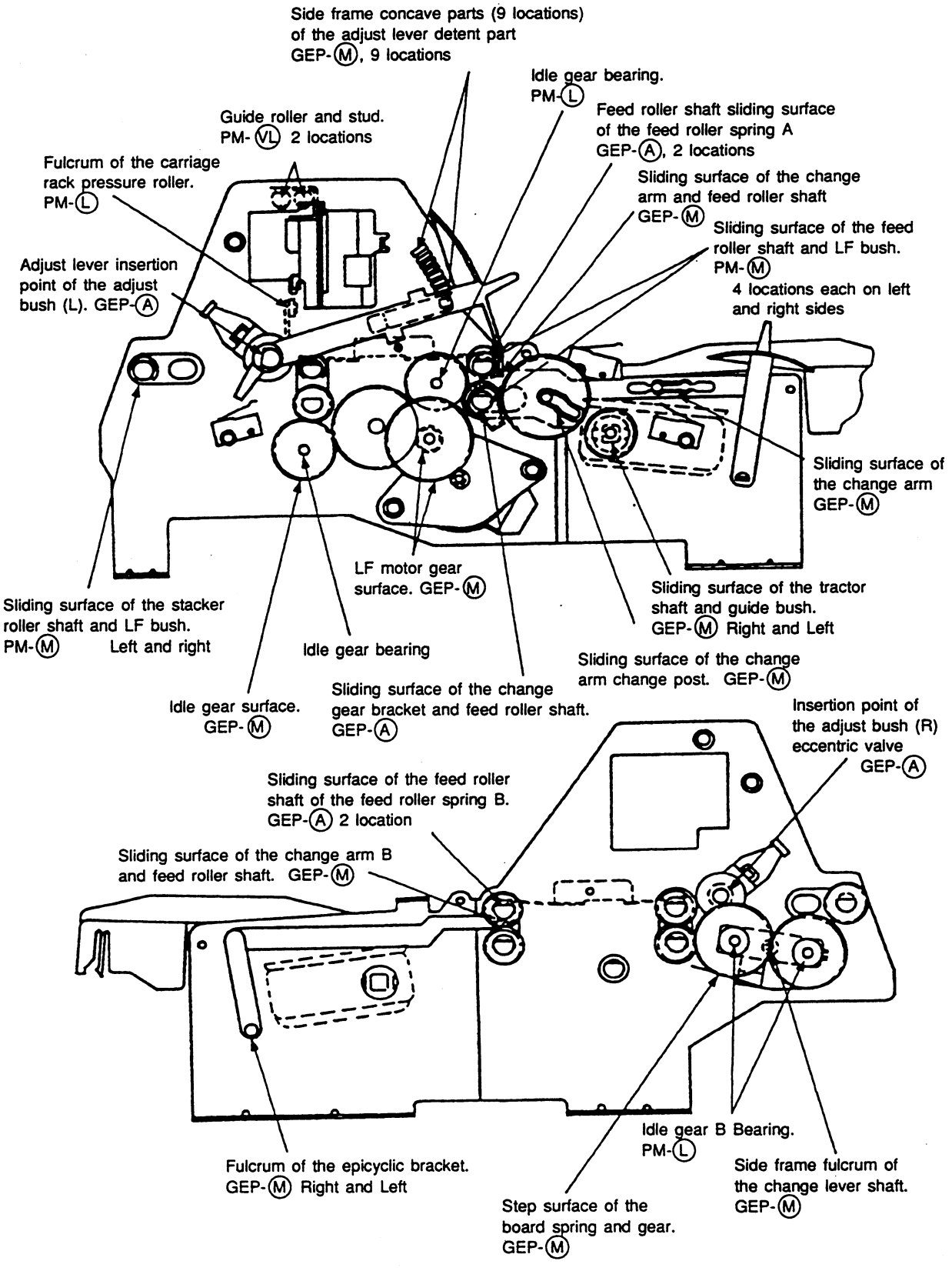
b) Space rack



c) Platen assembly



d) Printer mechanism


Side frame concave parts (9 locations) of the adjust lever detent part GEP-(M), 9 locations
Idle gear bearing. PM-(L)
Guide roller and stud. PM-(VL) 2 locations
Feed roller shaft sliding surface of the feed roller spring A GEP-(A), 2 locations
Fulcrum of the carriage rack pressure roller. PM-(L)
Sliding surface of the change arm and feed roller shaft GEP-(M)
Sliding surface of the feed roller shaft and LF bush. PM-(M) 4 locations each on left and right sides
Adjust lever insertion point of the adjust bush (L). GEP-(A)
Sliding surface of the change arm GEP-(M)
LF motor gear surface. GEP-(M)
Sliding surface of the stacker roller shaft and LF bush. PM-(M) Left and right
Idle gear bearing
Sliding surface of the tractor shaft and guide bush. GEP-(M) Right and Left
Sliding surface of the change arm change post. GEP-(M)
Idle gear surface. GEP-(M)
Sliding surface of the change gear bracket and feed roller shaft. GEP-(A)
Insertion point of the adjust bush (R) eccentric valve GEP-(A)
Sliding surface of the feed roller shaft of the feed roller spring B. GEP-(A) 2 location
Sliding surface of the change arm B and feed roller shaft. GEP-(M)
Idle gear B Bearing. PM-(L)
Fulcrum of the epicyclic bracket. GEP-(M) Right and Left
Side frame fulcrum of the change lever shaft. GEP-(M)
Step surface of the board spring and gear. GEP-(M)

7. TROUBLESHOOTING AND REPAIR

7. TROUBLESHOOTING AND REPAIR

7.1 Items to Check before Repair

Before servicing the printer ask the customer, if possible, under what conditions the problem occurred, and record the customer's responses.

Before troubleshooting, set up the printer to operate under the same conditions as at the time the problem occurred and check whether the problem is reproducible. If the problem is not reproducible, perform the printer's self test and thoroughly test the printer's functions. If the problem is reproducible, proceed to the troubleshooting section.

7.2 Method of Troubleshooting

Verify the problem and then locate the problem in according to the detailed procedure given for each item in Table 7-1.

Before correcting the problem, throughly read the precautions in Section 4.1.

The checkpoints for the SHPQ board and the SHPO-2 board are shown in Figures 7-1 and 7-2. The connector locations and pin numbers are shown in Figure 7-3.

Table 7-1

Status	Details	Flowchart item No.
Problems at power on	• Power is not supplied.	①
	• Spacing operation is not performed normally.	②
Problems during printing operation	• Wrong character, character or dot omission.	③
	• Line feed problem.	④
	• Malfunction of switches of operation panel.	⑤
	• Data receiving failure.	⑥

7.3 Lamp Display

(1) Printer mode display

(2) Fault alarm display

When the printer detects a variety of alarm conditions, these alarm conditions are displayed by LEDs. Alarm condition status is displayed by various MODE LEDs, which are lit along with the POW LED and the flashing ALM LED.

The details are listed below:

Table 7-2

Printer mode		ALARM LED	SELECT LED	EJECT DIRECTION LED	Contents	Remarks
Normal operation mode	ON LINE	OFF	ON	Don't care	Indicates that the printer is ready to receive data and print.	
	HEX DUMP mode				Indicates that the printer is in hex dump mode.	
	LOCAL mode	OFF	OFF	Don't care	Indicates that the printer is in local mode.	
	MENU mode	OFF	OFF	Don't care	Indicates that the printer is in menu mode.	
Operator alarm condition	Paper end	ON	OFF	Don't care	Form end, single sheet end, or bottom paper end.	
	Paper jam				SASF paper jam	
	CSF paper jam				Paper jam or paper end, when CSF is installed.	
	Print suppress	OFF	BLINK	Don't care	Indicates that the printer is in the print suppress mode.	
	CSF detach alarm	ON	OFF	BLINK	Indicates that the printer is in the CSF detach alarm mode.	
	Continuous -to- cut-sheet switching alarm				Indicates that the printer is in the continuous-to-cutsheet switching alarm mode.	
Internal fault alarm condition		BLINK	OFF	Don't care		

Table 7-3

Error condition	Lit mode LED besides POW and flashing ALM LED	Contents
Memory error	10	CPU internal RAM error
	12	Program ROM error
	UTL	EEPROM error
	12, PROP	External RAM error
	HSD	CGROM error
	QUIET	Program error
	PROP	Serial I/F board error
Spacing error	20	Spacing error

*PROP: PROPORTIONAL

Table 7-4

Alarm	LEDs				Comment
	Primary Message			Detail Message	
	Menu	ALARM	SEL		
Paper out	Current mode	ON	OFF	Current CPI	alarm occurs 1/6" (4.35mm) from bottom edge
Print head Temp	BLINK	OFF	ON	Current CPI	after cool down, continues to print

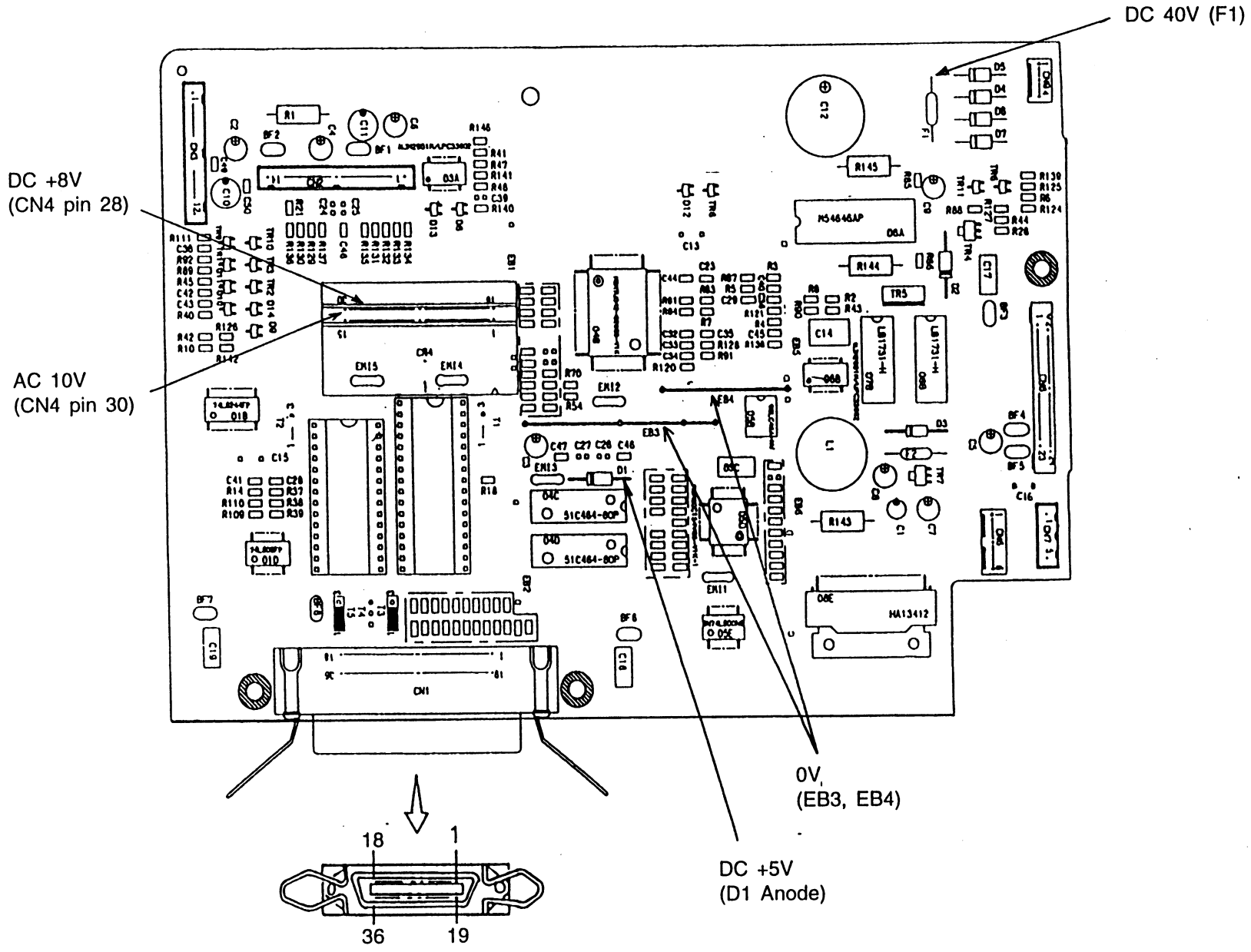
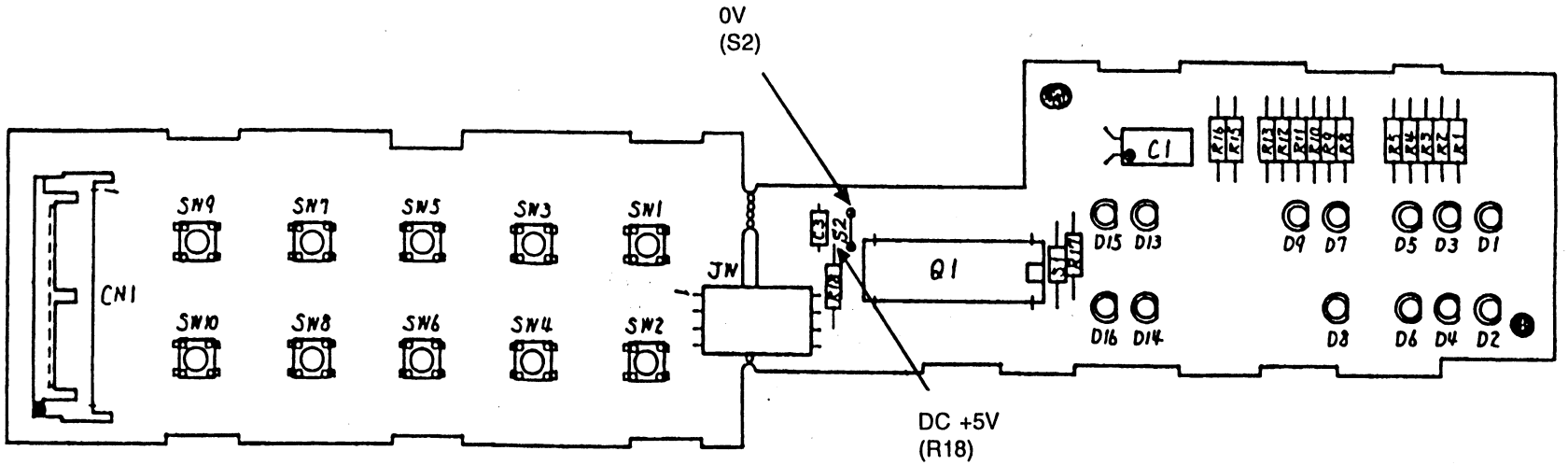


Figure 7-1 Check points on the control board (SHPQ)

SW1...MODE or EXIT
SW2...SEL
SW3...LINE FEED or GROUP
SW4...EJECT DIR.
SW5...FORM FEED or ITEM
SW6...Not used
SW7...PAPER PARK or SET
SW8...PRINT QUALITY
SW9...TOF/QUIET or PRINT
SW10...CHR PITCH



D1...POWER
D2...SEL
D3...ALARM
D4...QUIET
D5...EJECT DIRECTION
D6...MENU
D7...HSD
D8...UTL
D9...NLQ
D13...10
D14...12
D15...20
D16...PROP

Figure 7-2 Check points on the operator panel board (SHPO-2)

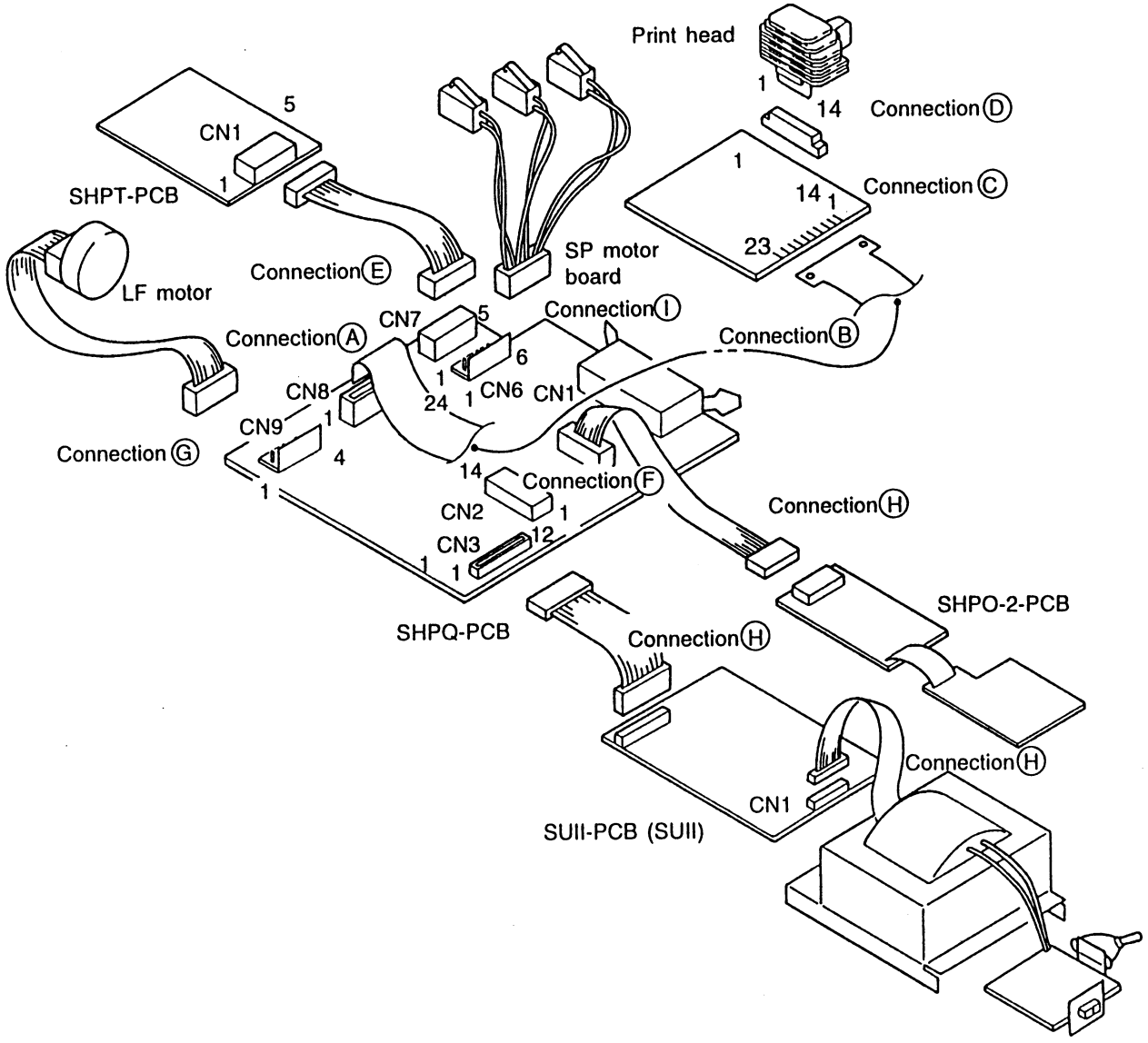


Figure 7-3 Connection locations and pin numbers

Table 7-5 Pin numbers and signal names

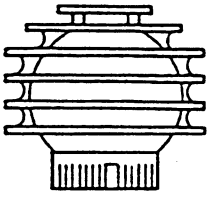
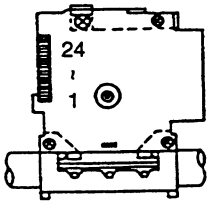
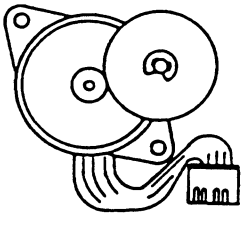
Name	Signal Name	Connection						Coil Resis-tance	Figure
		A	B	C	D	G	H		
PRINT HEAD	GAP	3	2					Approx. 18.8Ω	Pins on print head Back of print head  1 - 14
	TMP	10	9	7	7				
	+40V	8,9	7,8	8-10	8-10				
	+5V	20	19						
	SG	11,21	10,20	6	6				
	#1	16	15	1	1				
	#2	15	14	2	2				
	#3	4	3	14	14				
	#4	14	13	3	3				
	#5	5	4	13	13				
	#6	13	12	4	4				
	#7	6	5	12	12				
	#8	12	11	5	5				
	#9	7	6	11	11				
SP MOTOR	U	18	17					Approx. 21Ω	Pins on SP motor 
	V	17	16						
	W	19	18						
	ØA	23	22						
	ØB	22	21						
LF MOTOR	Ø1					2		Approx. 8.7Ω	Contacts on the LF motor 
						1			
	Ø2					3			
						4			
POWER	+40V						1-3		
	EP						4,5		
	+5V						6,7		
	0V						8,9		
	+8V						10		
	AC 10V						11		
	ALM						12		

Table 7-5 Pin numbers and signal names

Name	Signal Name	Connection								Coil Resis-tance	Figure
						F	E	I			
OPERA-TOR PANEL	SEL SW					9					
	MODE SW					5					
	LF SW					1					
	FF SW					2					
	PARK SW					3					
	TOF SW					4					
	PRINT SW					11					
	CHAR SW					10					
	LED DATA					7					
	LED CLK					8					
	+5V					6					
	0V					14					
	ED SW					13					
	—					12					
Sensor PCB	PAPER END						2				
	TABLE SENSE						1				
	0V						4,5				
	+5V						3				
Micro Switch Assy	CSF CONNECT							2			
	HEADGAP							6			
	CUTSHEET							4			
	0V							1,3,5			

① No power

- Are AC cables being connected correctly?

YES

NO

- Connect the AC cables correctly.

- Is the AC fuse open on the primary side of the filter assembly?

NO

YES

- Replace the fuse.

- Are +5V and +40V being supplied to the control board?

+5V : Measurement can be taken between D1 Anode and EB 3 or 4 (control board).

+40V : Measurement can be taken between F1 and EB 3 or 4 (control board).

YES

NO

- Is the fuse F1 open on the power supply board?

NO

YES

- Replace fuse F1.

- Is the connector cord being connected to CN3 (control board) or CN2 (power supply board) correctly?

YES

NO

- Connect the connector cord to CN3 (control board) or CN2 (power supply board) correctly.

- Replace the power supply board (see Section 4.3.6).

- Replace the control board (see Section 4.3.4).

② Space operation does not operate normally

- Is the carriage assembly moving erratically or jammed?

YES

NO

- Check around the carriage assembly and space motor and repair the mechanism.

- Are +5V and +40V being supplied to the control board?

YES

NO

- Is the connector cord being connected to CN3 (control board) or CN2 (power supply board) correctly?

NO

YES

- Replace the power supply board (see Section 4.3.6).

- Connect the connector cord to CN3 (control board) or CN2 (power supply board) correctly.

- Is CN8 contact connection normal?

YES

NO

- Connect the head cable to CN8 correctly.

- Replace the control board (see Section 4.3.4).

- Has the condition been corrected?

YES

NO

- Replace the space motor (see Section 4.3.20).

- END

③ Wrong character, character or dot omission

- Is the head cable being inserted into CN8 of the SHPQ board correctly?

YES

- Replace the print head (see Section 4.3.18).
- Is condition corrected?

YES

- END

NO

- Reset the head cable to CN8 correctly.

NO

- Replace the control board (see Section 4.3.4).
- Has the condition been corrected?

NO

- Is the space motor board contact normal?

YES

- Replace the space motor (see Section 4.3.20).

NO

- Reset the head cable.

YES

- END

④ Line feed trouble

- Rotate the platen knob. Does the platen rotate smoothly?

YES

NO

- Switch the paper release lever to the continuous forms or cut-sheet. Does the platen rotate smoothly?

YES

NO

- Reinstall paper
- Make sure that no foreign matter or dust is present on the platen gear, idler gear or drive gear.
- Ensure smooth meshing of the platen gear, idler gear and drive gear.
- Ensure correct operation of the push tractor assembly (R) or (L).
- Replace the push tractor assembly (R) or (L).

- Is LF motor cable connected being with control board correctly?

YES

NO

- Connect it correctly.

- Replace the control board (see Section 4.3.4).

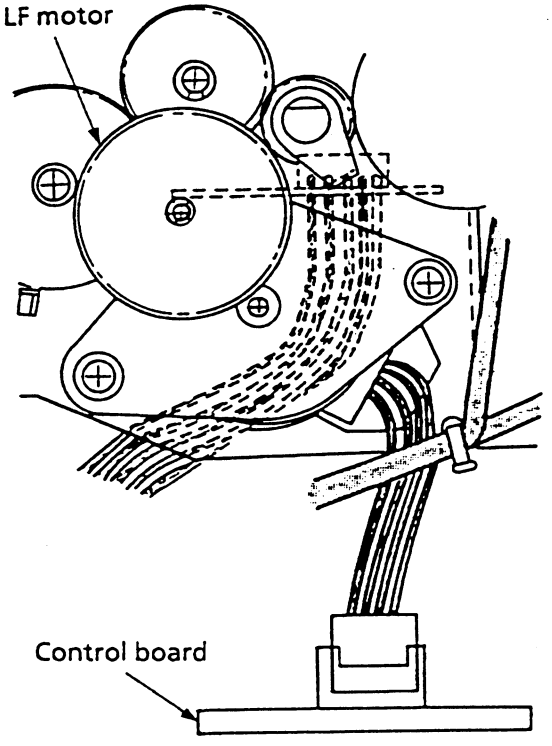
- Remedied?

YES

NO

- Replace the LF motor (see Section 4.3.9).

- END



⑤ Malfunction of switch on operation board

- Is the operator board being inserted into CN2 correctly?

YES

NO

- Connect it correctly.

- Replace the operator board (see Section 4.3.13). Has the condition been corrected?

YES

NO

- Replace the control board (see Section 4.3.4).

- END

⑥ Data receiving failure

- Is the SELECT lamp on?

YES

NO

- Set to SELECT mode.

- Is the interface cable being connected correctly?

YES

NO

- Connect it correctly.

- Replace the control board (see Section 4.3.4).

APPENDICES

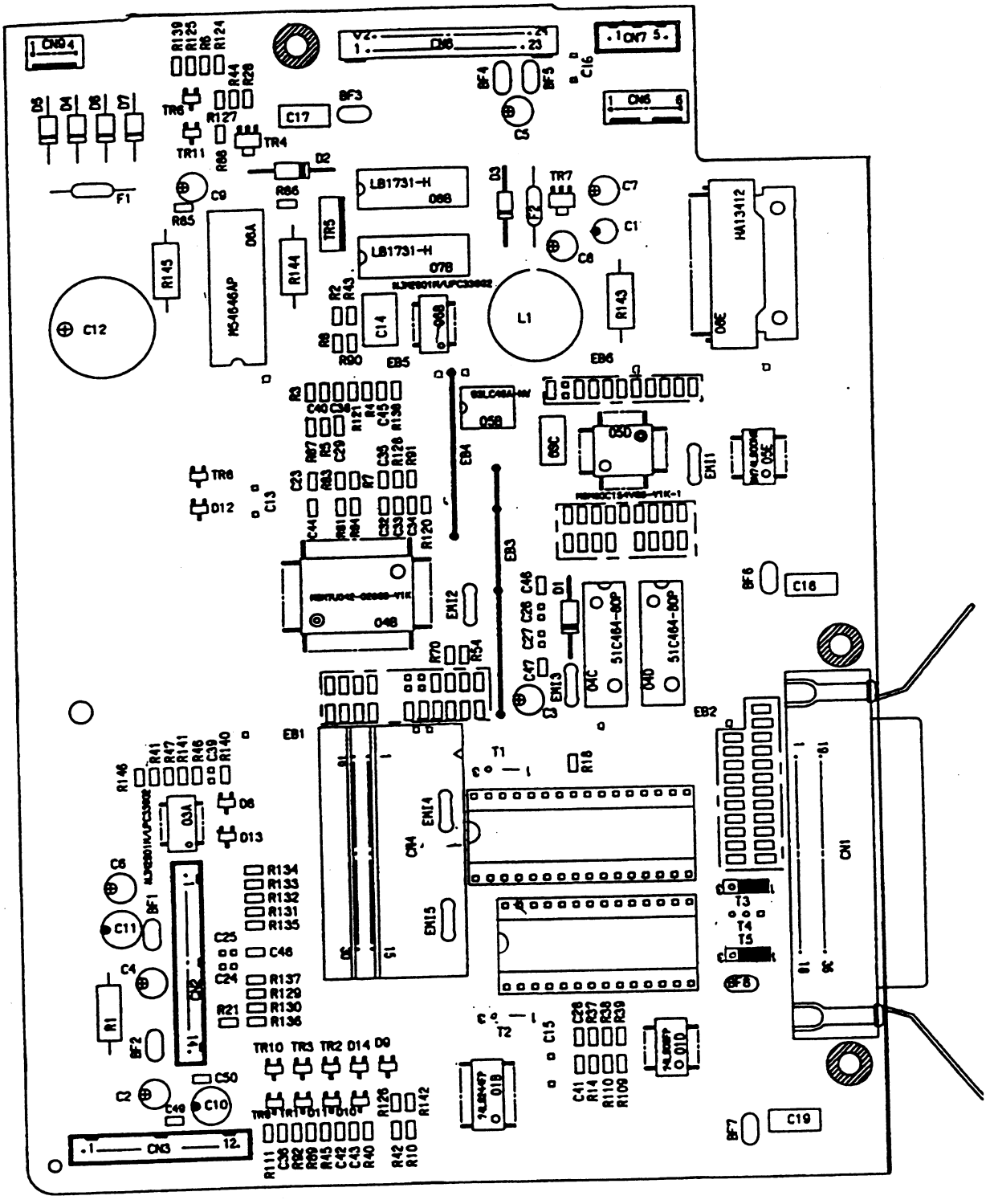
APPENDIX A PCB LAYOUT

(1) SHPQ-PCB (control board)

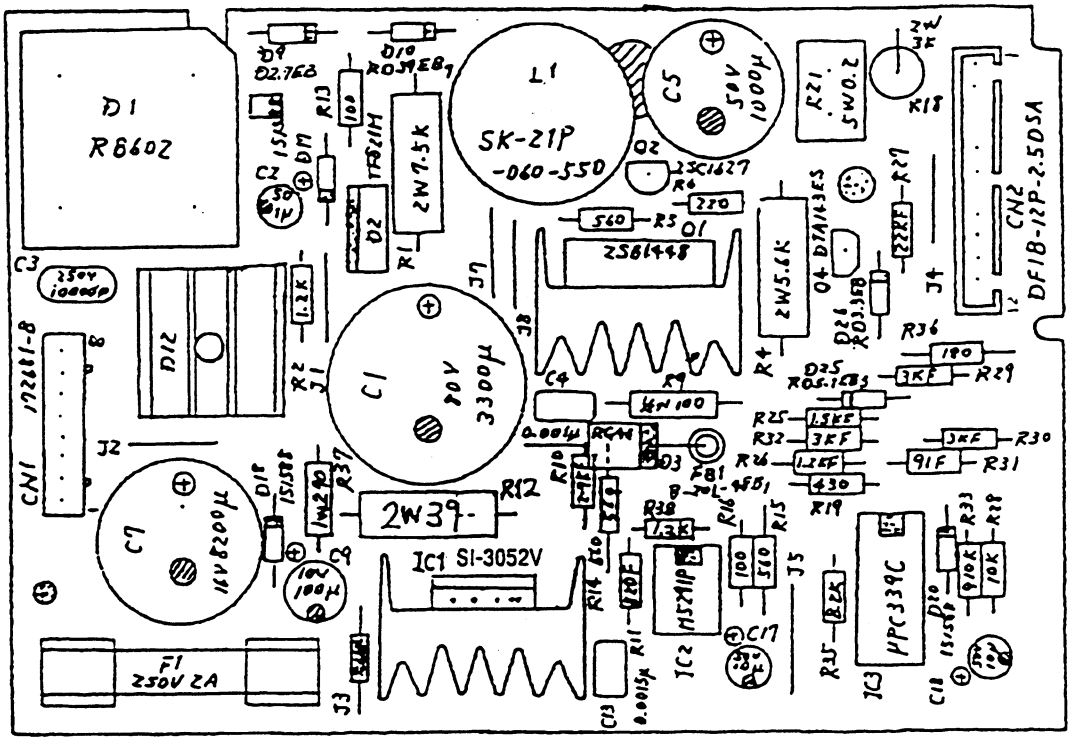
(2) SUII-PCB (power supply board)

(3) SHPT-PCB (sensor board)

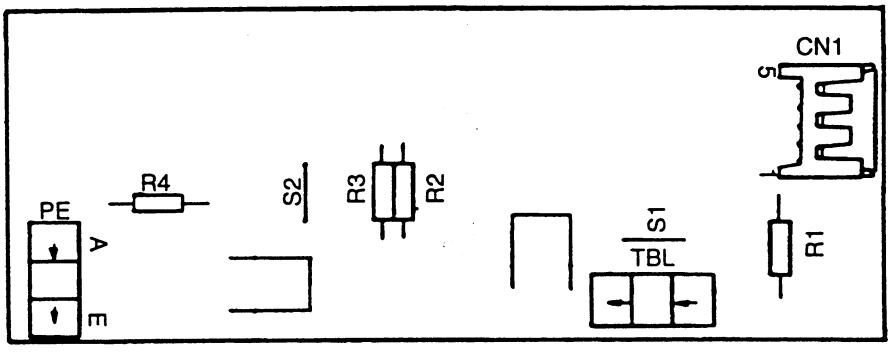
(4) SHPO-2-PCB (operator panel board)



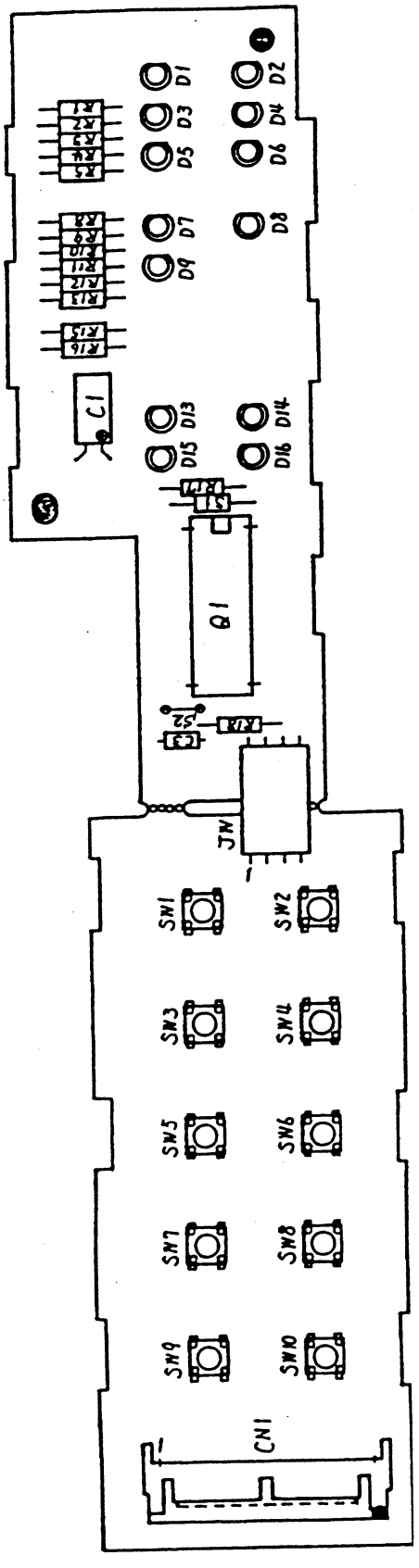
SHPQ-PCB (control board)
Rev. 1 PCB Version 2



SUII-PCB (power supply board)
Rev. 4 PCB Version 4



SHPT-PCB (sensor board)
Rev. 1 PCB Version 2



SHPO-2-PCB (operator panel board)
Rev. 1 PCB Version 2

APPENDIX B SIGNAL LIST

Signal abbreviation	Signal name	Function
0V	Signal Ground	Ground for logic circuits
+5V	+5 V	Power supply for logic circuits
+8V	+8 V	Power supply for linear circuits
+40V	+40 V	Power supply for drive circuits
AD0 - AD7	Address Data Signal	80C154 address/data bus signal
A7 - A0	Address Bus	80C154 address bus signal
A15 - A8	Address Bus Signal	80C154 address bus signal
A16	Address Signal	Address signal for program ROM
AC10V	AC 10 V	Power supply for RS-232C interface ±9V
ACK-N	Acknowledge	Centronics I/F signal which indicates that input of data has been completed.
ALM	Alarm	Alarm signal of printhead or space motor
AUTO FEED-N	Automatic Paper Feed Signal	Centronics interface signal. When this signal is active, line feed is performed after printout. (However, this signal is effective only for printers set for EPSON emulation.)
BUSY	Busy	Centronics I/F signal for indicating that the printer is busy.
CAS-N	Column Address Strobe	Signal for strobing a column address to the D-RAM
CD	Carrier Detect	RS-232C interface signal which indicates that the host side is sending data.
CGA16	CGROM Address Signal	Address signal for CGROM
CGRD	CGROM Read Signal	Select signal of CGROM or D-RAM
CHAR SW-N	Character Pitch Switch Signal	Signal which indicates that the switch for selecting print pitch for 10, 12 and so forth has been pressed.

[Note] *"-N" in signal abbreviation denotes signal is active in low state.*

"-P" in signal abbreviation denotes signal is active in high state.

Signal abbreviation	Signal name	Function
CSF CONNECT-N	Cut-Sheet Feeder Connect Signal	CSF interface signal Indicates that the CSF is connected.
CTS	Clear to Send	RS-232C interface signal Indicates that host side is ready.
CUTSHEET	Cut-Sheet signal	Signal which indicates that the paper release lever is set to Cut-Sheet position.
DATA1-DATA8	DATA	Centronics I/F Signals for receiving data
D-RAMA7~ D-RAMA0	D-RAM Address	Address bus signal for the D-RAM
DSR	Data Set Ready	RS-232C interface signal which indicates that the host side has completed the preparations for sending data.
DTR	Data Terminal Ready	RS-232C interface signal indicating printer is ready.
EDSW-N	Eject Direction switch	Signal which indicates that Eject Direction switch has been pressed.
EECLK	EEPROM Clock	Timing shift clock for reading/writing EEPROM data.
EECS	EEPROM Chip Select	Signal for selecting EEPROM chip.
EEDIN	EEPROM Data In	Data signal for writing to EEPROM.
EEDOUT	EEPROM Data Out	Signal to output data from EEPROM.
EP	Power Ground	Drive circuit system ground.
FAULT-N	Fault Signal	Centronics I/F signal for displaying alarm state of a printer.
FFSW-N	Form Feed Switch Signal	Signal which indicates that FF switch has been pressed.
FG	Frame Ground	Chassis ground.
HD ALM	Head Alarm	Signal for detecting an abnormality in the head drive circuit.
HEAD9-N~ HEAD1-N	Head Data	Printing data signal
HEAD GAP-N	Head Gap Signal	Signal which indicates that the head gap is set to range "5".
HEADON-N	Head On Signal	Head drive control signal.
HEADTMPCT-N	Head Temperature Control	Head temperature detection level selection signal.
HEAD TEMP-N	Head Temperature	Signal which indicates that the head temperature has risen above the specified normal value.

Signal abbreviation	Signal name	Function
I-PRIME-N	Input Prime	Centronics I/F signal for initializing the printer.
IF D8-IF D1	Interface Data	Data received via the centronics and RS-232C interface.
IFRD-N	Interface Read	Timing signal for the RS-232C interface control section to read data from the printer control section.
IPT-N	Interrupt	Interrupt signal to 80C154.
LEDDATA	LED Data	Serial data to light/extinguish LEDs on the operator panel.
LEDCLK	LED Clock	Shift clock for serial data to light/extinguish LEDs on the operator panel.
LFOVD	Line Feed Over Drive	Signal for controlling slice levels of LF motor driving currents.
LF HOLD-N	Line Feed Motor Hold	Signal to change the slice level while LF motor is in the hold mode.
LF PHA	Line Feed Phase A	LF motor phase reversing signal A.
LF PHB	Line Feed Phase B	LF motor phase reversing signal B.
LF SW-N	Line Feed Switch Signal	Signal which indicates that LF switch has been pressed.
MODE SW-N	Mode Switch Signal	Signal which indicates that the mode switch for selecting PRINT/MENU has been pressed.
OPSWRD	Operator Panel Switch Read	Read signal for operator panel switch from the LSI chip (MSM7U042).
PAPER END-N	Paper End	Signal indicating out of paper condition.
PARK SW-N	Parking Switch Signal	Signal which indicates that a park switch has been pressed.
PE	Paper End	Centronics I/F signal which indicates that the printer is in the paper end state.
PHASE A	Phase Signal A	Space motor phase A encoder output signal.
PHASE B	Phase Signal B	Space motor phase B encoder output signal.
PRINT SW-N	Print Quality Switch Signal	Signal which indicates that the switch for specifying utility or letter quality mode has been pressed.
PSEN-N	Program Store Enable	Timing signal for 80C154 to load an external program.
RxD	Receive Data	RS-232C interface Reception signal line.
RAS-N	Row Address Strobe	Row address strobe signal to D-RAM.
RD-N	Read	Read signal from the CPU (80C154).

Signal abbreviation	Signal name	Function
RET-SG	Return Signal Ground	Centronics I/F Return ground for centronics I/F signal line.
RST IN	Reset In	RS-232C interface circuit initialize signal.
RSTON-N	Reset On	Printer initialize signal, from Space Motor Alarm.
RST OUT	Reset Out	Printer initialize signal.
RTS	Request to Send	RS-232C interface Sending request signal.
S-I/FON-N	Serial Interface On	Control signal for a handshake between the print control side and the RS-232C interface control side.
S-I/FRST	Serial Interface Reset	Signal for soft resetting the RS-232C interface control port.
SEL SW-N	Select Switch Signal	Signal which indicates SEL switch has been pressed.
SLELCT	Select	Centronics I/F signal which indicates that the printer is ready to receive data.
SG	Signal Ground	Ground for logic circuits.
SLCTIN-N	Select In	Centronics interface signal which controls validity/invalidity of DC1/DC3 signal. (However, this signal is effective only for printers set for EPSON emulation.)
SP ON/OFF	Space On-Off Signal	Signal for controlling slice levels of DC space motor driving current.
SPALM	Space Alarm	Signal for detecting an abnormality in the drive circuit of the space motor.
SPD/A	Space Digital-Analog signal	Signal for controlling DC space motor drive current.
U	Space Motor-U	Analog phase signal of the DC space motor.
V	Space Motor-V	Analog phase signal of the DC space motor.
W	Space Motor-W	Analog phase signal of the DC space motor.
SPU	Space U	Digital phase signal of the DC space motor.
SPV	Space V	Digital phase signal of the DC space motor.
SPW	Space W	Digital phase signal of the DC space motor.
SRSTOUT	System Reset Out	Fast printer initialize signal.
SSD	Supervisory Send Data	RS-232C interface signal to indicate Reception enable state.
STB-N	Data Strobe	Centronics interface Timing signal for making the printer receive data.

Signal abbreviation	Signal name	Function
TABLE SENSE-N	Table Sense	Signal to indicate if there is a paper installed or not on the table.
TMP	Temperature	Output signal that indicates that the temperature of the head has exceeded the specified temperature value.
TOF SW-N	Top of Form Switch signal	Signal which indicates that the TOF switch has been pressed.
TSD-N	Thermal Shut Down	Output signal that indicates that the temperature of the head has exceeded the specified temperature value.
TxD	Transmit Data	RS-232C interface transmission signal line.
WR-N	Write	Write signal from the CPU (80C154).

APPENDIX C CIRCUIT DIAGRAM

Table C-1 shows the meanings of symbols used in the circuit diagrams and pages C-3 (1/9) through C-19 (9/9) show the circuit diagrams.

Table C-1 Table of symbols

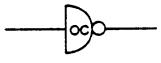
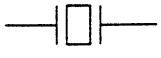
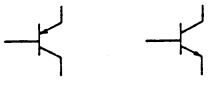
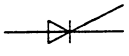
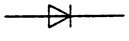
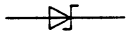
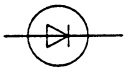
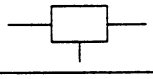
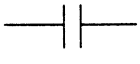
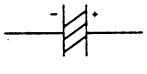
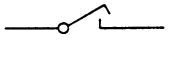
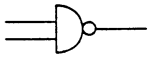
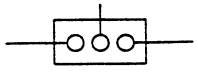
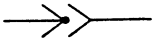
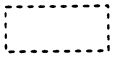
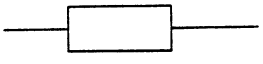
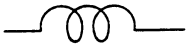
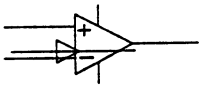
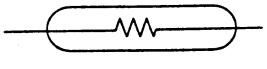
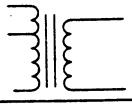
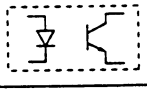
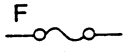
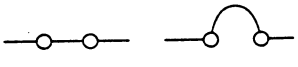
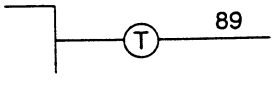
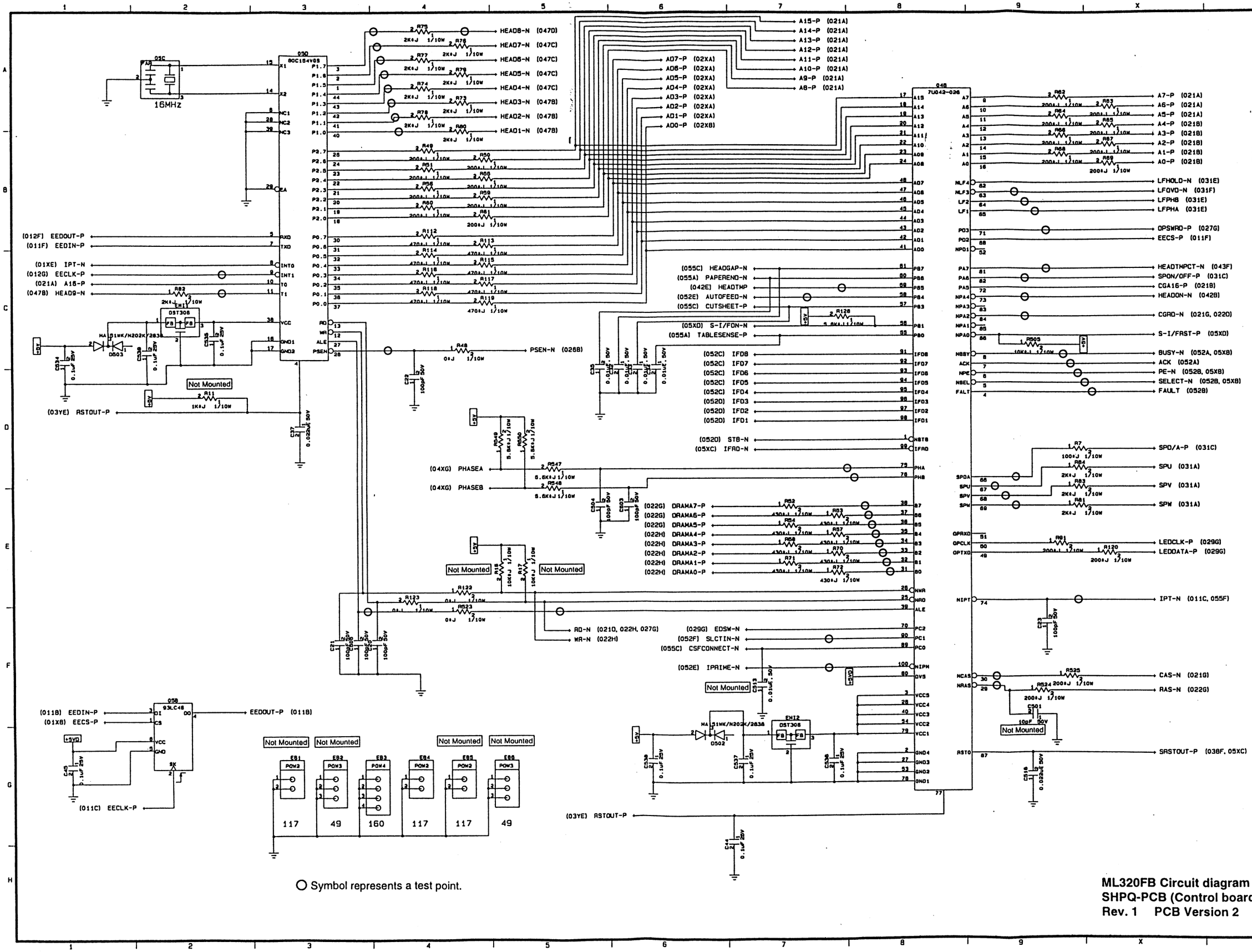
Symbol	Mark	Details
		SN74LS06 Inverter (open collector)
	OSC	Ceramic oscillator
	TR	Transistor
	SCR	Thyristor
	D	Diode
	D	Zener diode
	D	Light emitting diode
	REG	Regulator
	C	Capacitor
	C	Electrolytic capacitor
	R	Resistor
	SW	Switch
		SN74LS00 (NAND Gate)

Table C-1 (cont'd)

Symbol	Mark	Details
	T	Jumper wire or plug
	CN	Connector (terminal)
(Reference) 		Means a single part
		Dot head (element)
	FG	Frame ground
	L	Coil
		Comparator
	THERMISTOR	Thermistor
	SG	Signal ground
	TF	Transformer
		Photo sensor
F 	F	Fuse
	S, J	Jumper wire
		Check terminal



O Symbol represents a test point.

ML320FB Circuit diagram (1/9)
SHPQ-PCB (Control board) (1/5)
Rev. 1 PCB Version 2

SP	1	3
512	○	
1MEP	○	
1M Mask		○

Not Mounted (with IC socket)

Not Mounted (with IC socket)

Not Mounted

Not Mounted

Not Mounted

Not Mounted

(To 6/9)

ML320FB Circuit diagram (2/9)
SHPQ-PCB (Control board) (2/5)
Rev. 1 PCB Version 2

SP operating current: 0.8A (max.)

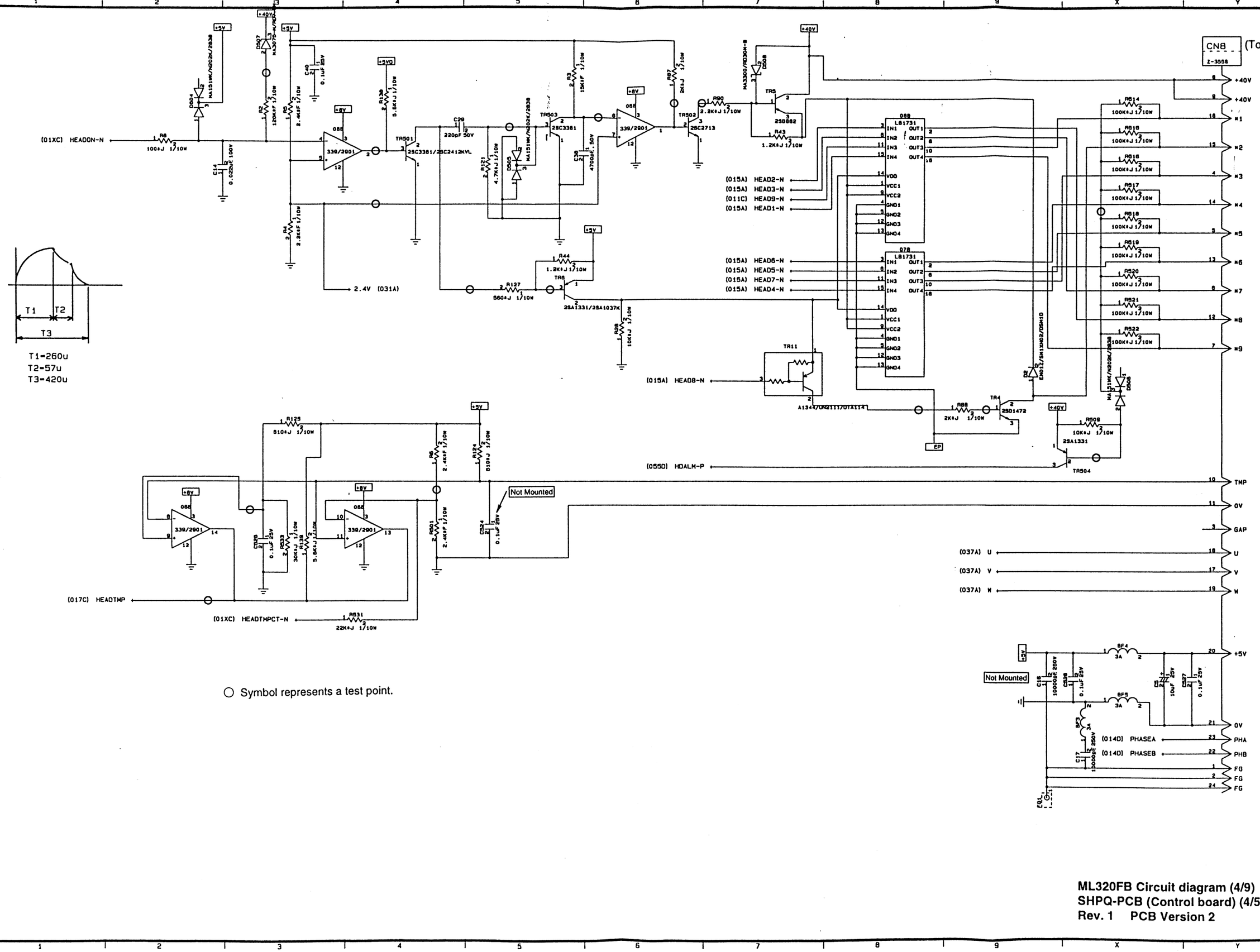
LF operating current: 650mA

LF HOLD current: 100-190mA

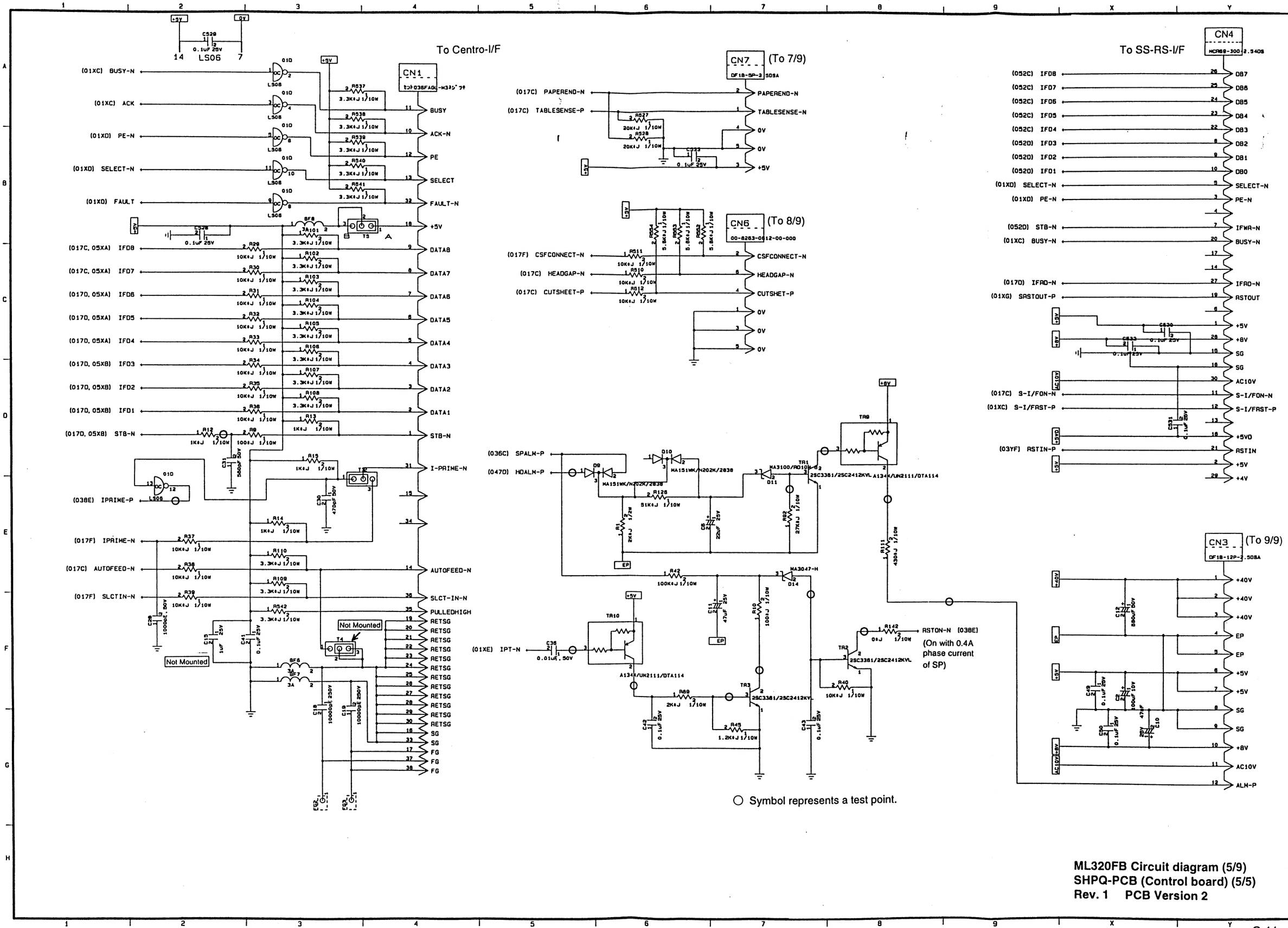
LF standby current: 40-45mA

O Symbol represents a test point.

ML320FB Circuit diagram (3/9)
SHPQ-PCB (Control board) (3/5)
Rev. 1 PCB Version 2

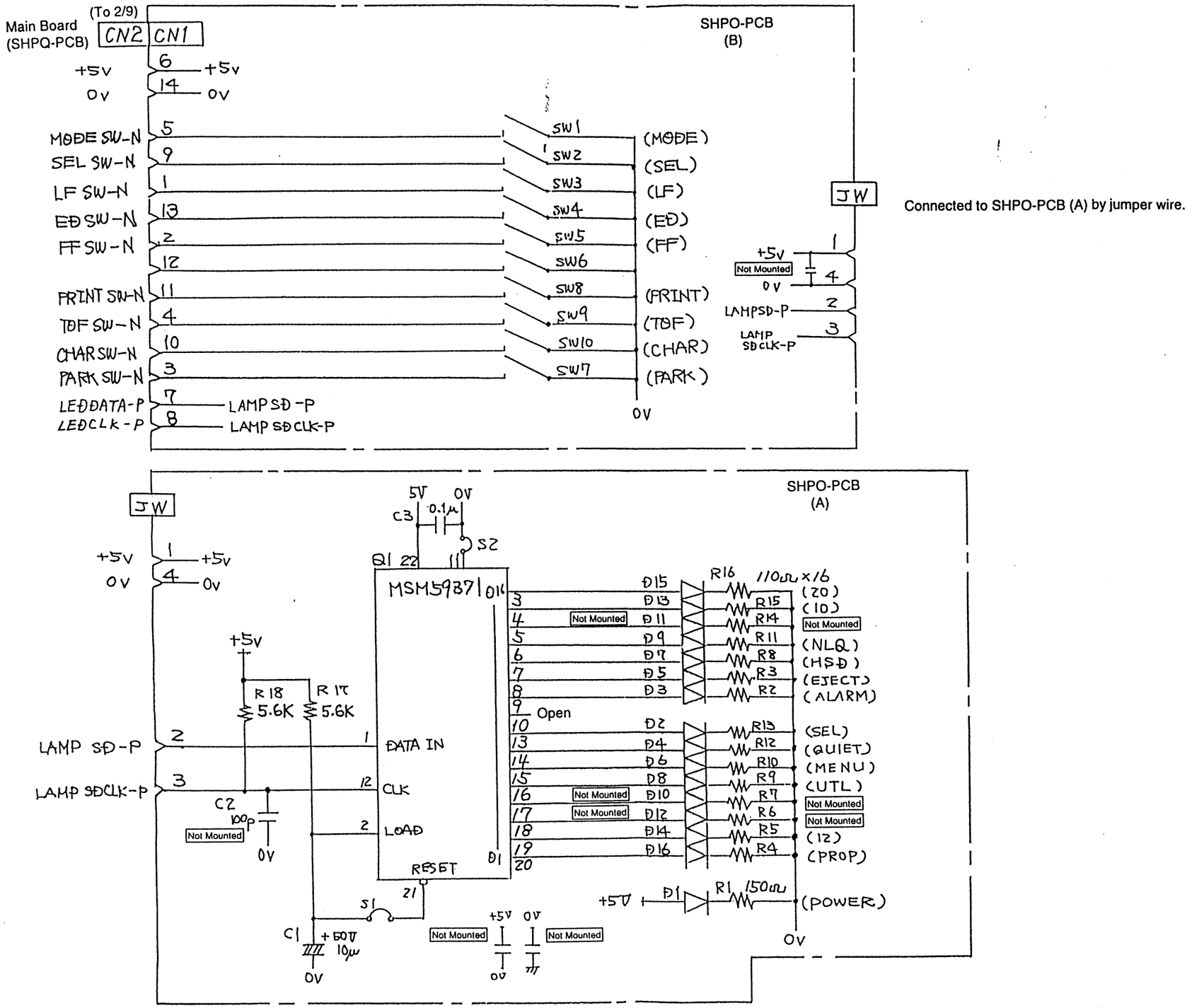


ML320FB Circuit diagram (4/9)
SHPQ-PCB (Control board) (4/5)
Rev. 1 PCB Version 2



○ Symbol represents a test point.

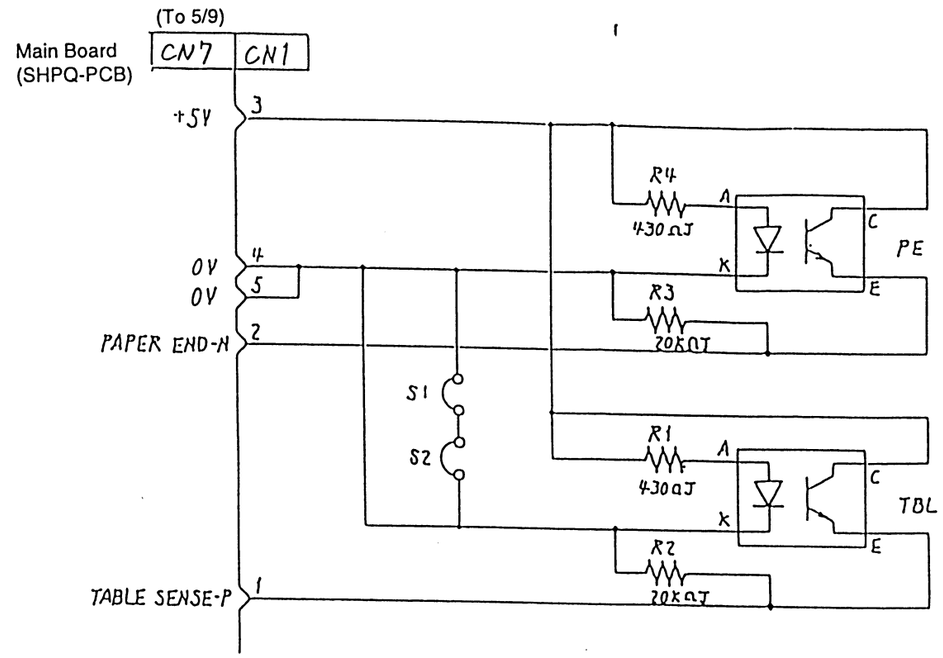
ML320FB Circuit diagram (5/9)
SHPQ-PCB (Control board) (5/5)
Rev. 1 PCB Version 2



Connected to SHPO-PCB (A) by jumper wire.

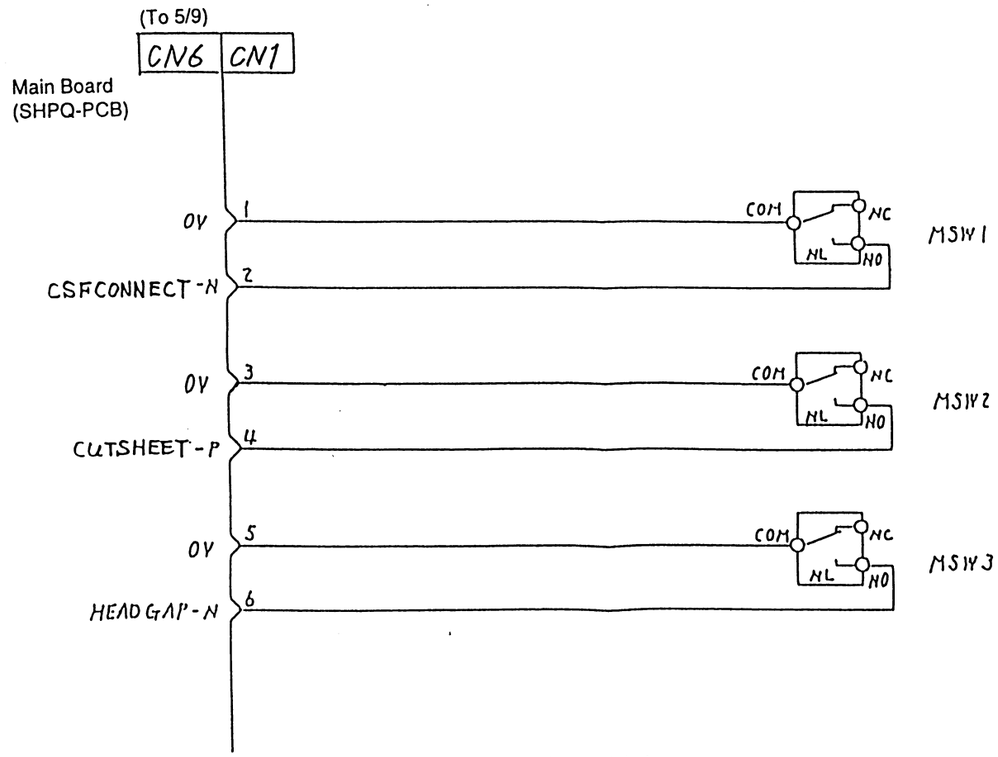
SHPŌ-PCB

ML320FB Circuit diagram (6/9)
SHPO-2-PCB (Operator panel board) (1/1)
Rev. 1 PCB Version 2

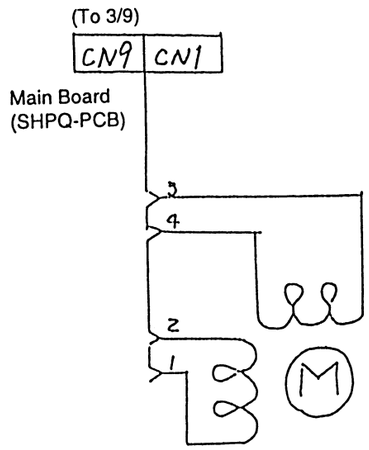


SHPT-PCB

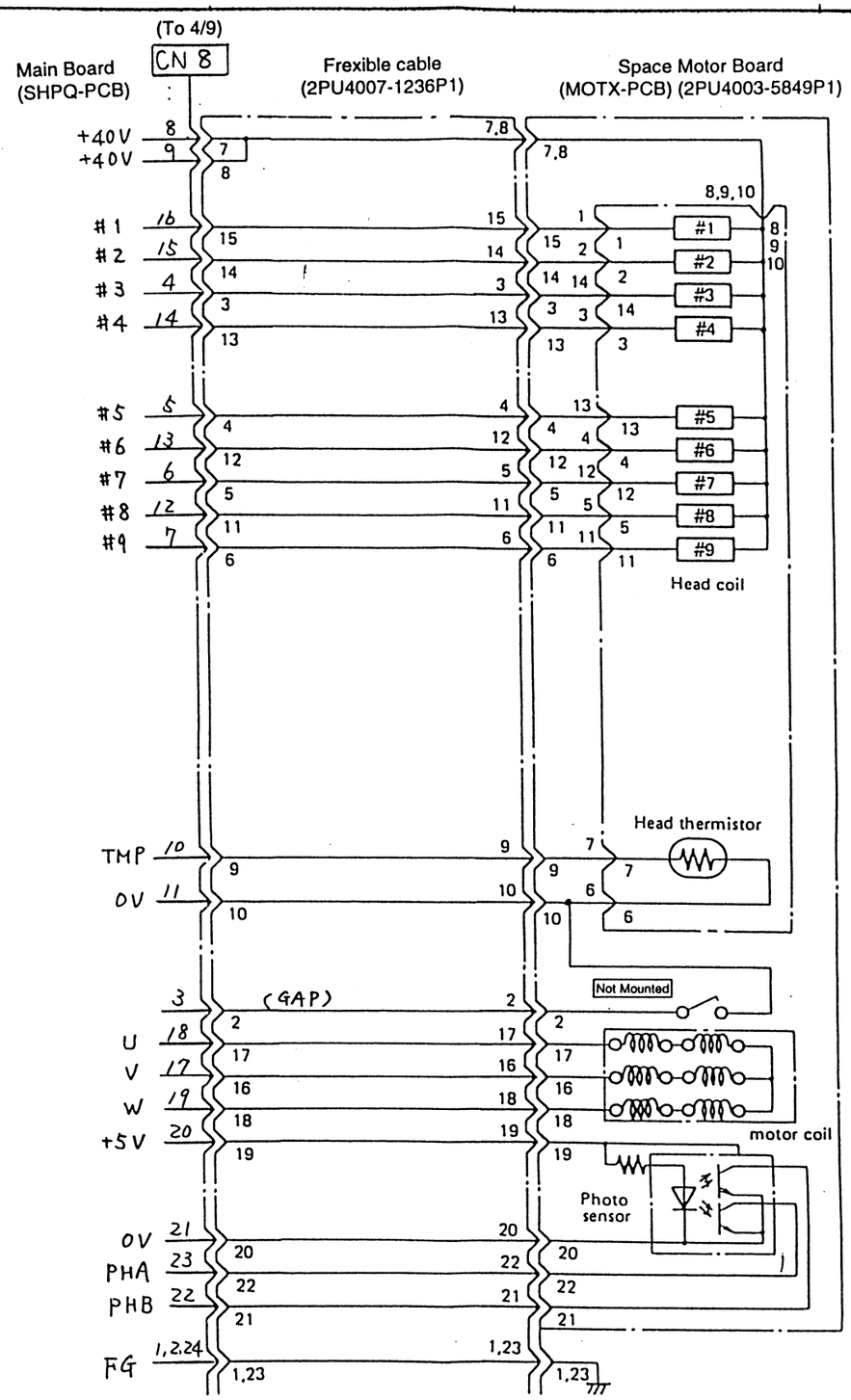
ML320FB Circuit diagram (7/9)
SHPT-PCB (Sensor board) (1/1)
Rev. 1 PCB Version 2



Microswitch Assy

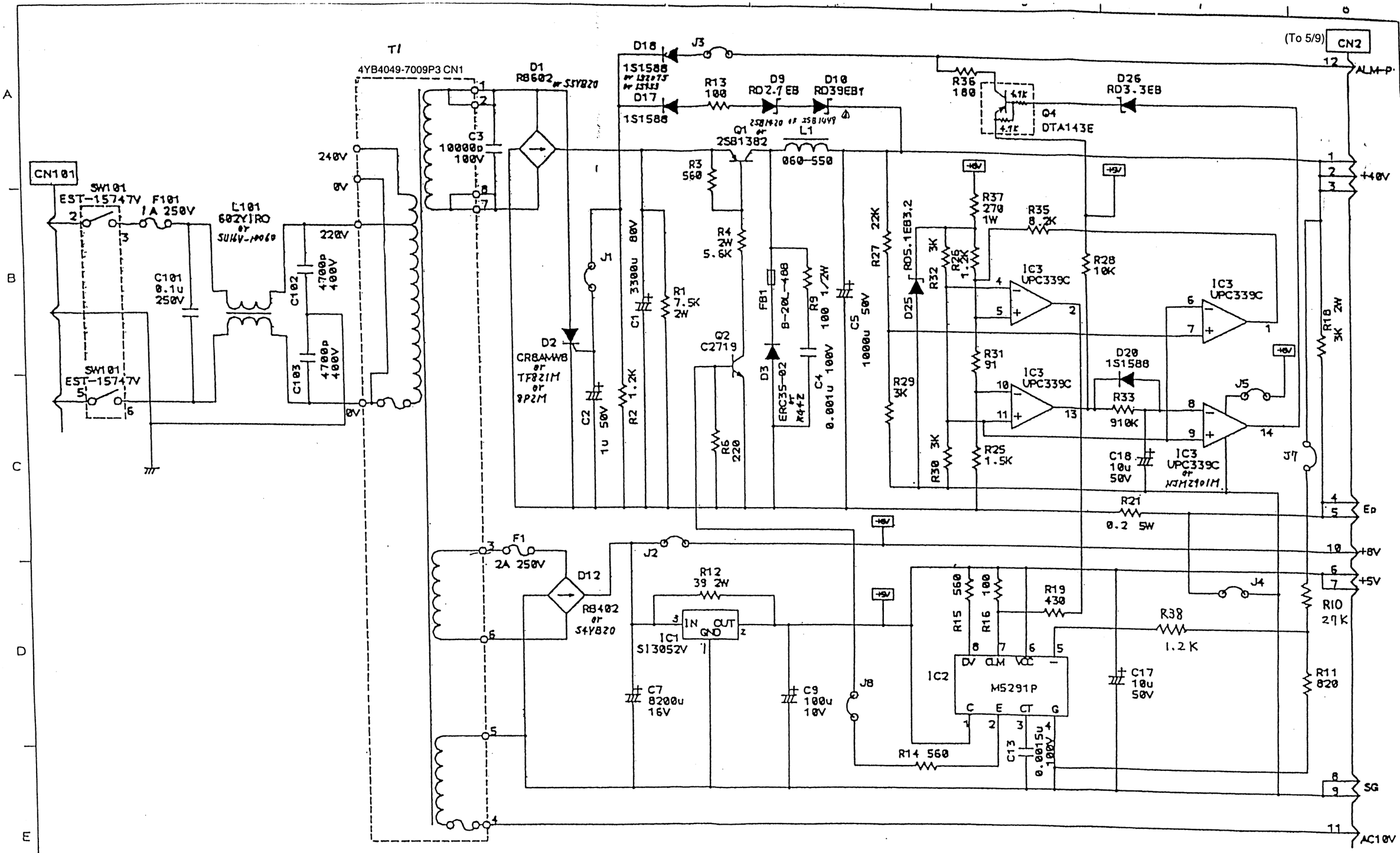


LF Motor



Space Motor Assy

ML320FB Circuit diagram (8/9)
Microswitch Assy (1/1)
LF Motor (1/1)
Space Motor Assy (1/1)



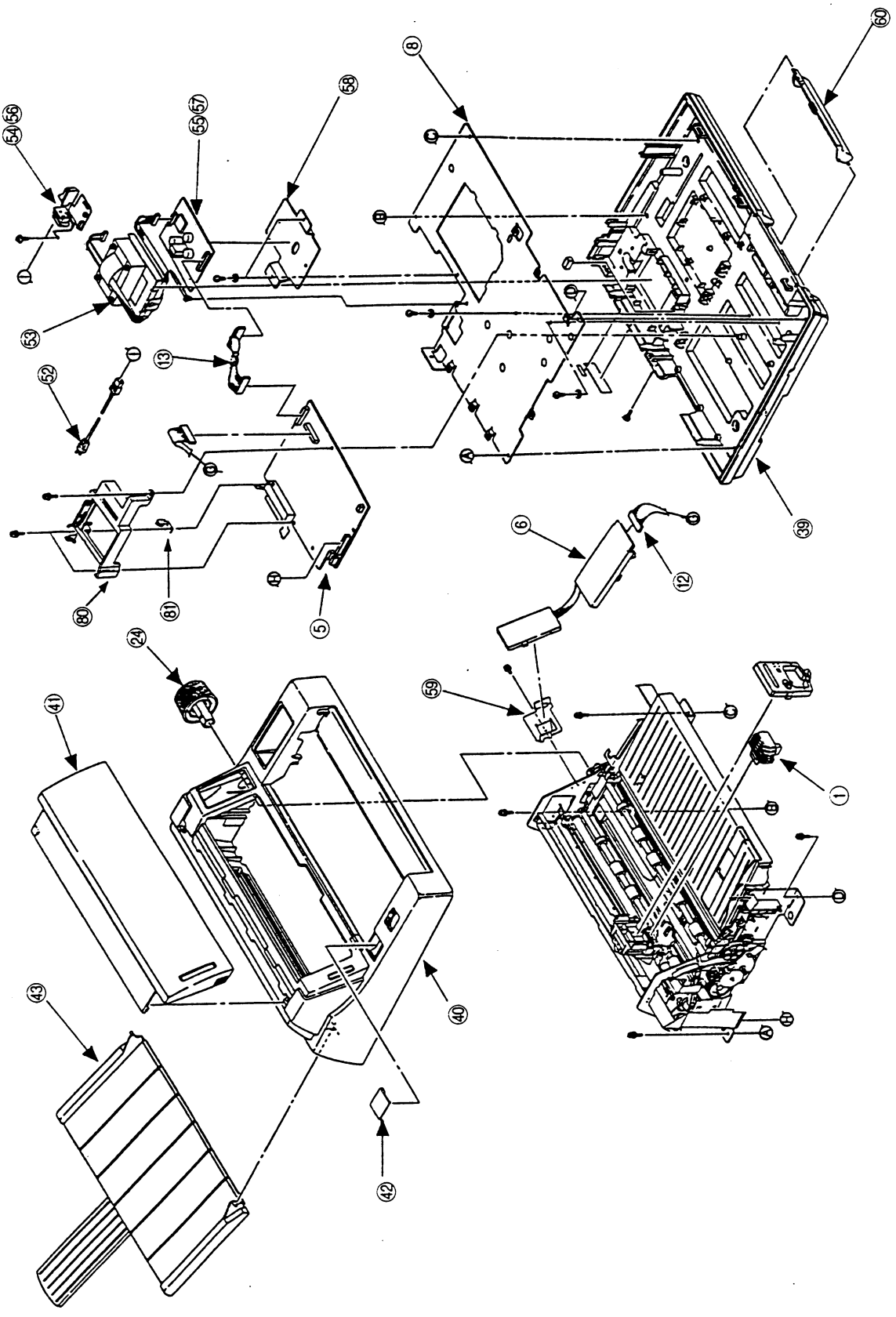
Power supply unit

ML320FB Circuit diagram (9/9)
Power supply unit (1/1)
Rev. 4 PCB Version 4

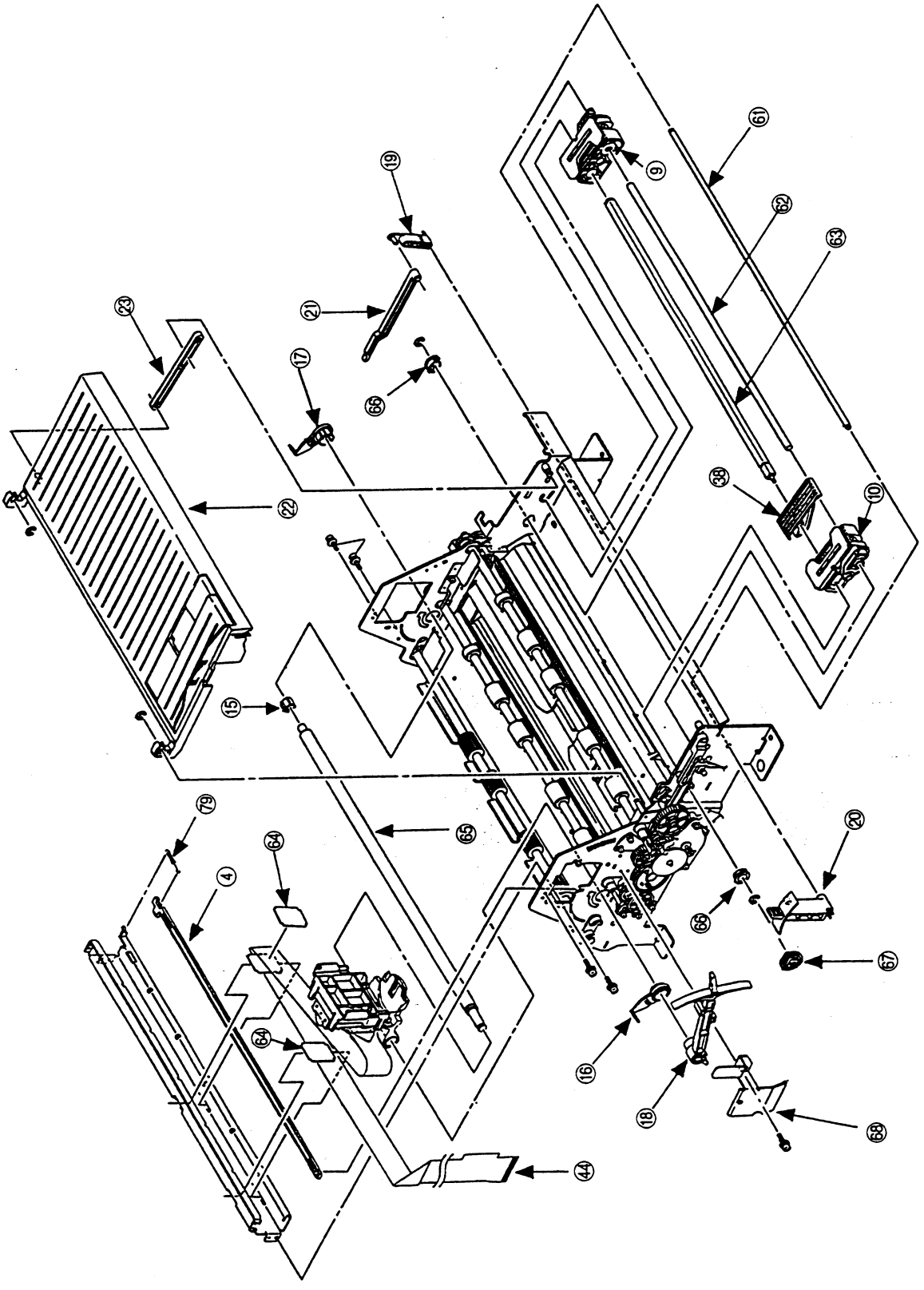
APPENDIX D SPARE PARTS LIST

Quantity of spare parts : Indicates the quantity necessary to maintain the units for one year/period.

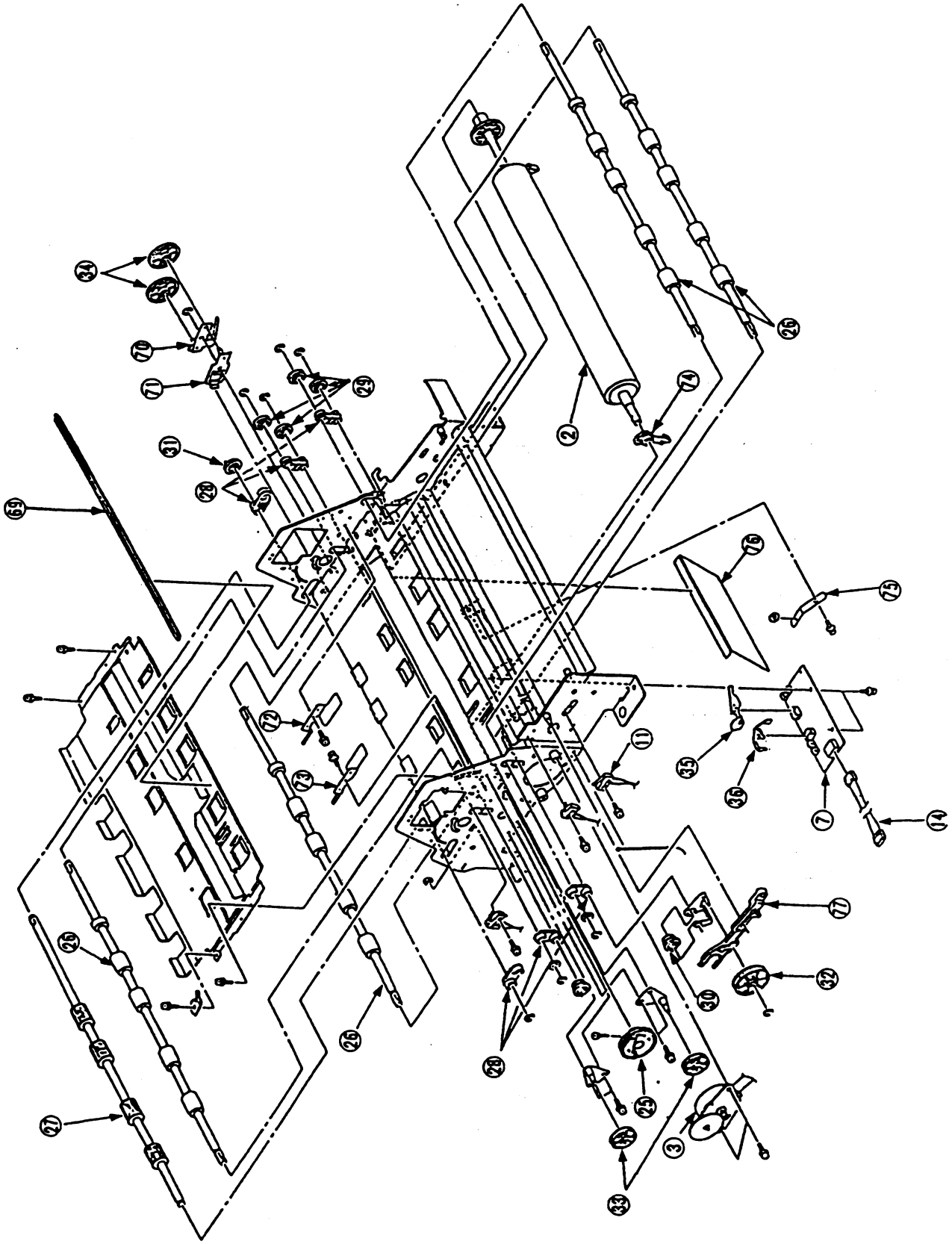
Condition : Number of units = 500 units
To be operated 2 hours/day
600 hours/year



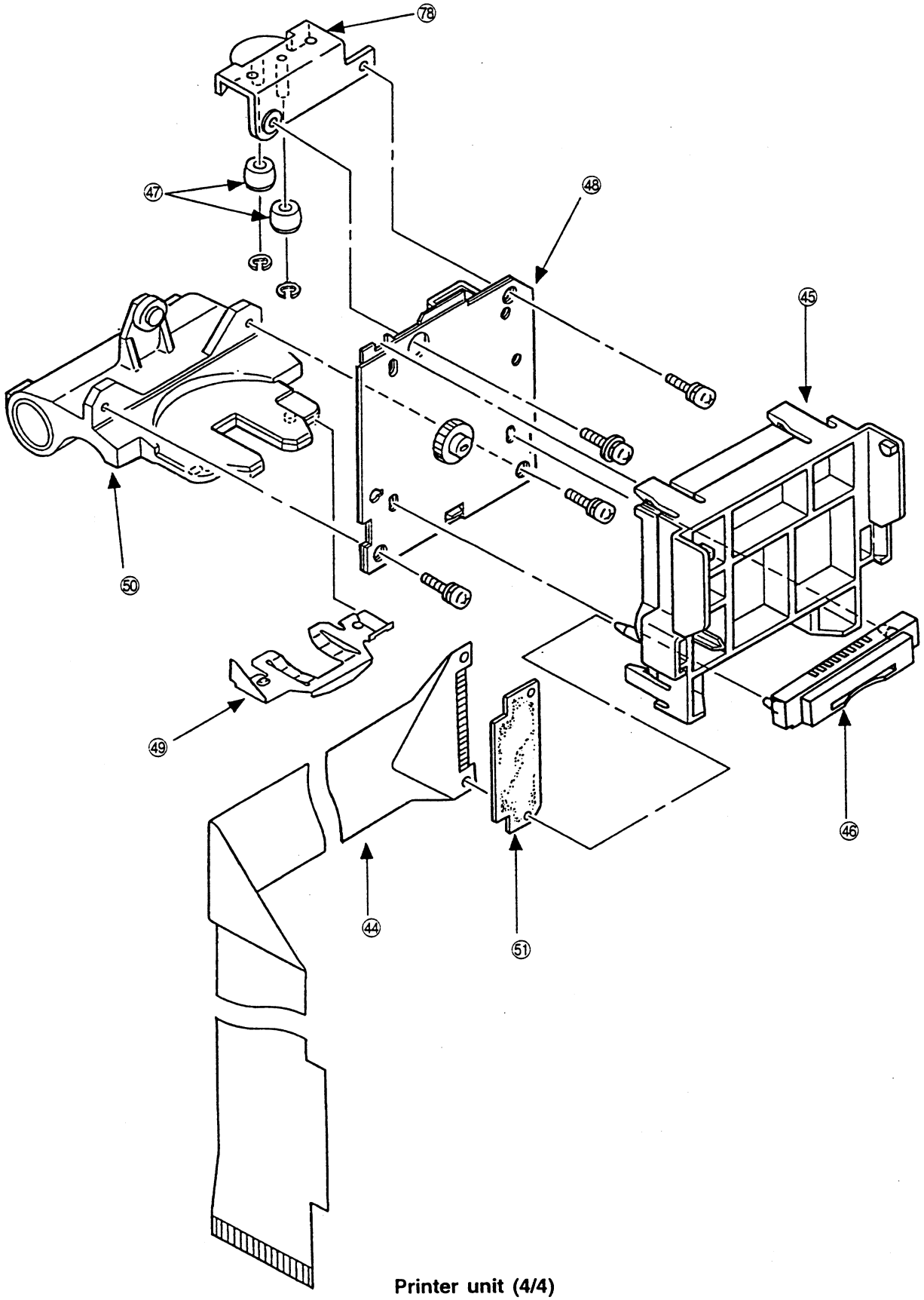
Printer unit (1/4)



Printer unit (2/4)



Printer unit (3/4)



Printer unit (4/4)

Spare parts list (1/3)

No.	Item No.	Item name	Q'ty	Q'ty of spare parts/year	Remarks
				500	
	(Printer Mechanism)				
1	4YA4025-1401G2	Print Head	1	9	
2	4PA4053-2270G1	Platen Assy	1	3	
3	3PB4053-1982P1	LF Pulse Motor	1	5	
4	4PP4053-2258P1	Space Rack	1	5	
5	4YA4053-3211G101	SHPQ-PCB (Control board)	1	3	PGROM excluded (for maintenance)
6	4YA4053-2291G2	SHPO-2-PCB (Operator panel)	1	3	
7	4YA4053-2289G1	SHPT-PCB (Sensor board)	1	3	
8	1PP4053-2015P1	Circuit Plate	1	1	
9	4PA4025-2636G1	Tractor Assy (R)	1	3	
10	4PA4025-2642G1	Tractor Assy (L)	1	3	
11	4YX4053-2148G1	Micro Switch Assy	1	3	
12	4YS4011-4367P2	Connector Cord (SHPQ-PCB-Operation Panel)	1	1	
13	4YX4053-2749G1	Connector Cord Assy (SHPQ-PCB-Power Supply board)	1	1	
14	4YS4011-4366P1	Connector Cord (SHPQ-PCB-SHPT PCB)	1	1	Sensor Cable
15	4PP4053-2206P1	Eccentric Collar	1	3	
16	4PP4053-2204P1	Adjustment bushing (L)	1	3	
17	4PP4053-2205P1	Adjustment bushing (R)	1	3	
18	3PP4053-2014P2	Adjustment lever	1	3	
19	4PP4053-2208P1	Change arm C	1	3	
20	3PP4053-1397P4	Change lever	1	3	
21	4PP4053-1978P1	Change arm B	1	3	
22	3PA4053-2260G1	Stage Assembly	1	3	OUK only
23	4PP4053-1410P1	Stage lock stay	1	3	
24	3PP4025-2871P1	Platen knob	1	5	
25	4PA4053-1972G1	Platen Gear Assy	1	3	
26	3PB4053-1973P1	Feed Roller Shaft	4	3	
27	3PP4053-1974G1	Stacker Shaft	1	3	
28	4PP4053-1330P1	LF bushing	6	3	
29	4PP4053-1321P1	LF knob gear	4	3	
30	4PP4053-1331P1	LF gear	2	3	
31	4PP4044-2813P1	Stacker gear L	1	3	
32	4PP4053-1981P1	Change gear	1	3	
33	4PP4053-1980P1	Idle gear A	2	3	
34	4PP4053-2197P1	Idle gear B	2	3	
35	4PP4053-2473G1	Hitting of Sensor Arm A	1	3	
36	4PP4053-2474G1	Hitting of Sensor Arm B	1	3	

Spare parts list (2/3)

No.	Item No.	Item name	Q'ty	Q'ty of spare parts/year	Remarks
				500	
37					
38	4PP4025-2643P1	Sheet Guide	1	3	
	(Cover Parts)				
39	3PA4053-2417G1	Lower Cover	1	3	
40	2PP4053-2006G1	Upper Cover	1	3	
41	3PP4053-2007G25	Access Cover	1	3	OUK only
42	4PP4053-1445P7	Gear Cover	1	3	
43	3PA4053-2056G1	Sheet Stacker	1	3	
	(Carriage Unit)				
44	2PU4007-1236P1	Head Cable	1	10	
45	4PA4025-2955G2	Ribbon Feed Gear Assy	1	3	
46	3PB4025-1116P1	Connector (Head Connect)	1	3	
47	4PP4053-1315P1	Guide Roller	2	5	
48	4YX4025-1800G3	Space Motor Assy	1	5	
49	4PP4025-1048P1	Head Clamp	1	3	
50	4PP4053-2000G1	Carriage Frame Assy	1	3	
51	4PP4025-2960P1	Contact Pressure Rubber	1	3	
52	3YS4011-1272P1	AC Cable	1	1	230V (Continental) OUK only
	3YS4011-1273P1	AC Cable	1	1	240V (U.K.) OUK only
53	4YB4049-7009P3	Transformer	1	3	OUK only
54	4YB4049-7011P1	Filter Assembly	1	3	OUK only
55	4YB4049-7012P1	Power Supply Board	1	3	OUK only
56	4YB4049-7013P1	Fuse (Primary Side) (250V, 1A)	1		OUK only
57	4YB4049-7015P1	Fuse (Secondary Side) (250V, 2A)	1		OUK only
58	4PP4053-2021P1	Circuit Plate (B)	1	1	
59	4PP4053-2155P1	Bracket (A)	1	1	
60	2PP4053-2051P3	Card Cover	1	3	
61	4PP4053-1979P1	Change Lever Shaft	1	3	
62	4PB4053-3040P1	Lock Shaft	1	3	
63	4PP4053-1390P2	Tractor Shaft	1	3	
64	4PP4053-1383P1	Guide Plate	3	3	
65	4PB4053-2201P1	Carriage Shaft	1	3	
66	4PP4044-1304P1	Guide Bush	2	3	
67	4PP4044-1550P1	Driven Gear	1	3	

Spare parts list (3/3)

No.	Item No.	Item name	Q'ty	Q'ty of spare parts/year	Remarks
				500	
68	4PP4053-2273P1	Cable Guide	1	1	
69	4LM-7261-67	Polyurethane Foam	1	3	
70	4PP4053-2336G1	Friction Spring	1	3	
71	4PP4053-2195G1	Epicyclic Bracket	1	1	
72	4PP4053-1983P1	Feed Roller Spring B	1	3	
73	4PP4053-1976P1	Feed Roller Spring A	1	3	
74	4PP4053-1971P1	Platen Collar	1	3	
75	4PP4053-2023P1	Feed Roller Spring C	1	3	
76	4PB4053-2296P1	Guard	1	3	
77	4PP4053-1977P1	Change Arm A	1	3	
78	4PP4053-1361G1	Guide Roller Plate	1	3	
79	4PB4025-1106P1	Tension Spring	1	3	
80	2PP4053-3188P1	I/F Bracket	1	3	OUK only
81	4PP4053-3187P1	FG Spring	1	3	OUK only

APPENDIX E SUPER SPEED RS-232C (for ML390/391/320/321 Elite/320FB) SERIAL INTERFACE BOARD MAINTENANCE

1. GENERAL

This section describes the operation of the super speed RS-232C Serial Interface board installed in the Microline ML390/391/320/321 Elite/320FB as an option using a start-stop serial communications circuit. This serial interface board is capable of transmitting and receiving simultaneously at speeds up to 19,200 bits per second. Two protocols are available: printer Ready/Busy and X-ON/X-OFF modes.

2. OPERATION DESCRIPTION

2.1 Element Description

(1) 80C51 with MASK ROM

An eight-bit microprocessor controller that controls the following:
(a.) Serial interface protocol and data transfer through a serial port.
(b.) Message buffer.
(c.) Transmission of parallel data to the printer.

(2) SN75189

An RS-232C standard line receiver.

(3) SN75188

An RS-232C standard line driver.

(4) 2764

An 8k-byte ROM that contains the serial interface control program.

(5) HM6264

An 8192-byte static RAM used as a message buffer.

2.2 Circuit Description

A block diagram is shown in Figure E-1.

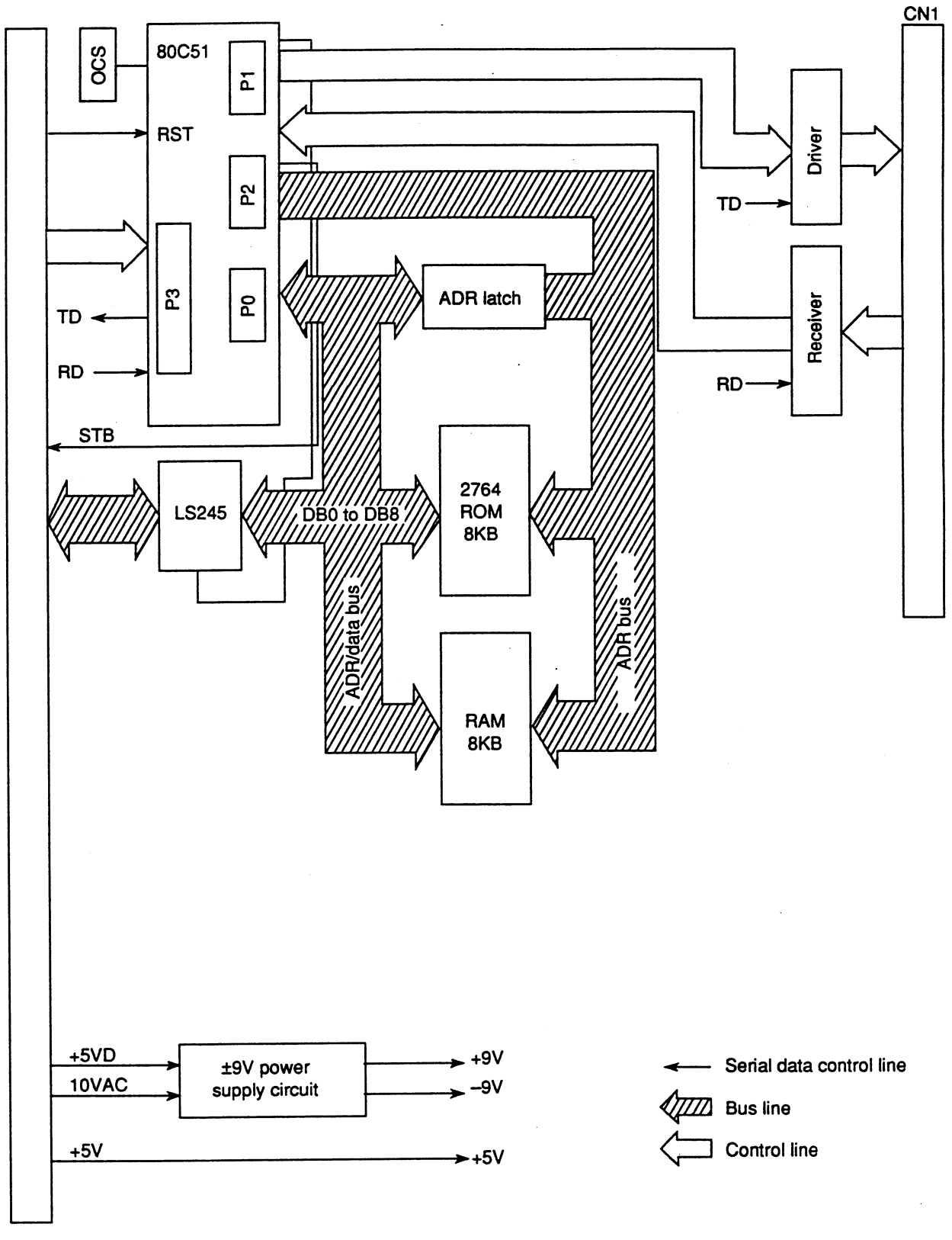


Figure E-1 Block diagram

2.2.1 Operation at power on

After power is turned on, an RST OUT signal is sent from the printer control board to reset the printer. When the reset is completed, the 80C51 CPU performs initialization. Initialization consists of setting the menu, setting the 80C51 timer, and setting the serial mode.

2.2.2 RS-232C interface

The DTR, SSD, TD and RTS signals output by the 80C51 are converted to RS-232C signals by line driver SN75188 (Q1) and sent to the host.

In addition, signals DSR, CTS, CD, and RD on the RS-232C interface are converted to TTL level by line receiver SN75189 (Q2) and input to the 80C51.

2.3 Communication Procedure Flowchart

2.3.1 Mode ⓐ

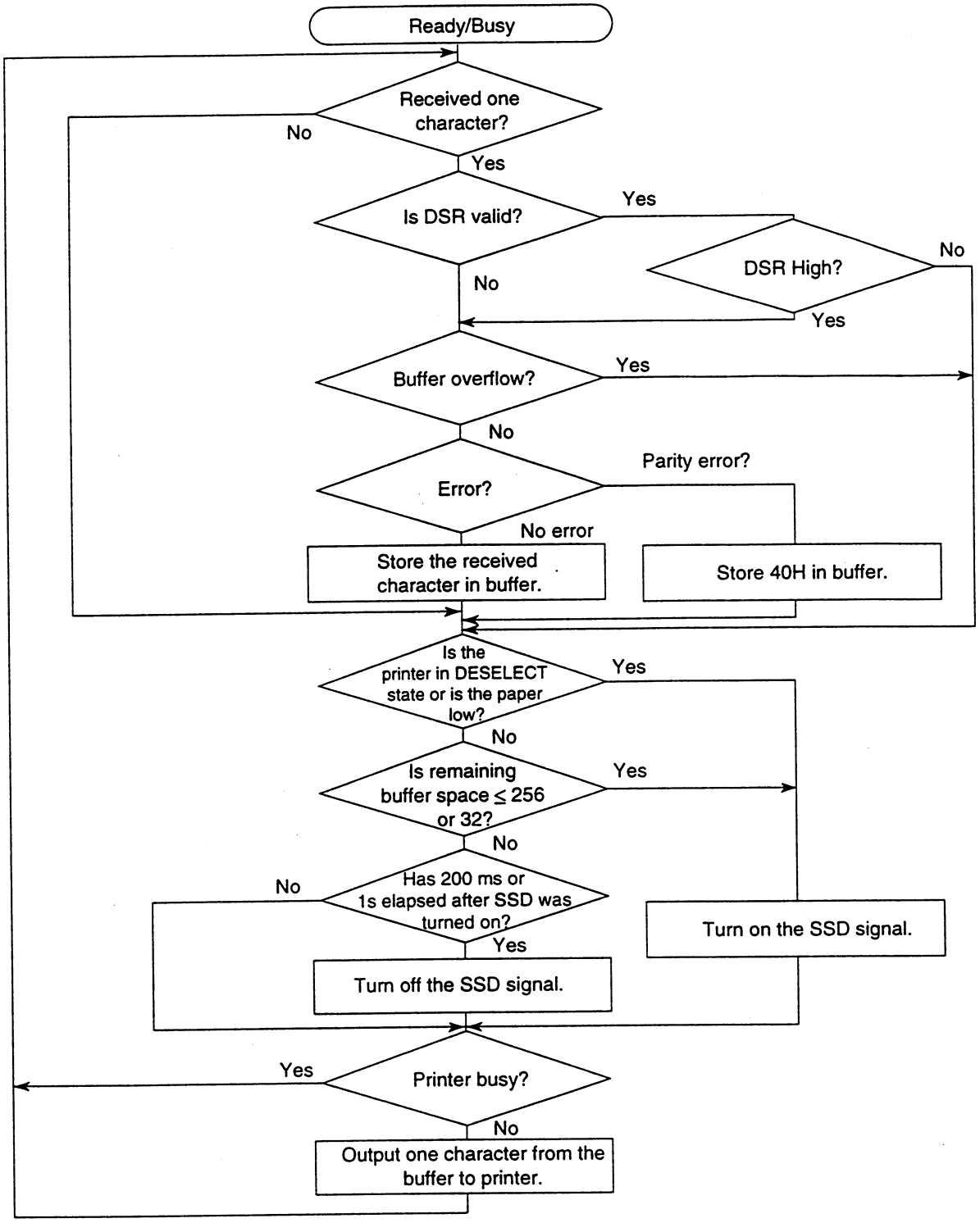


Figure E-2

2.3.2 Mode ⓑ

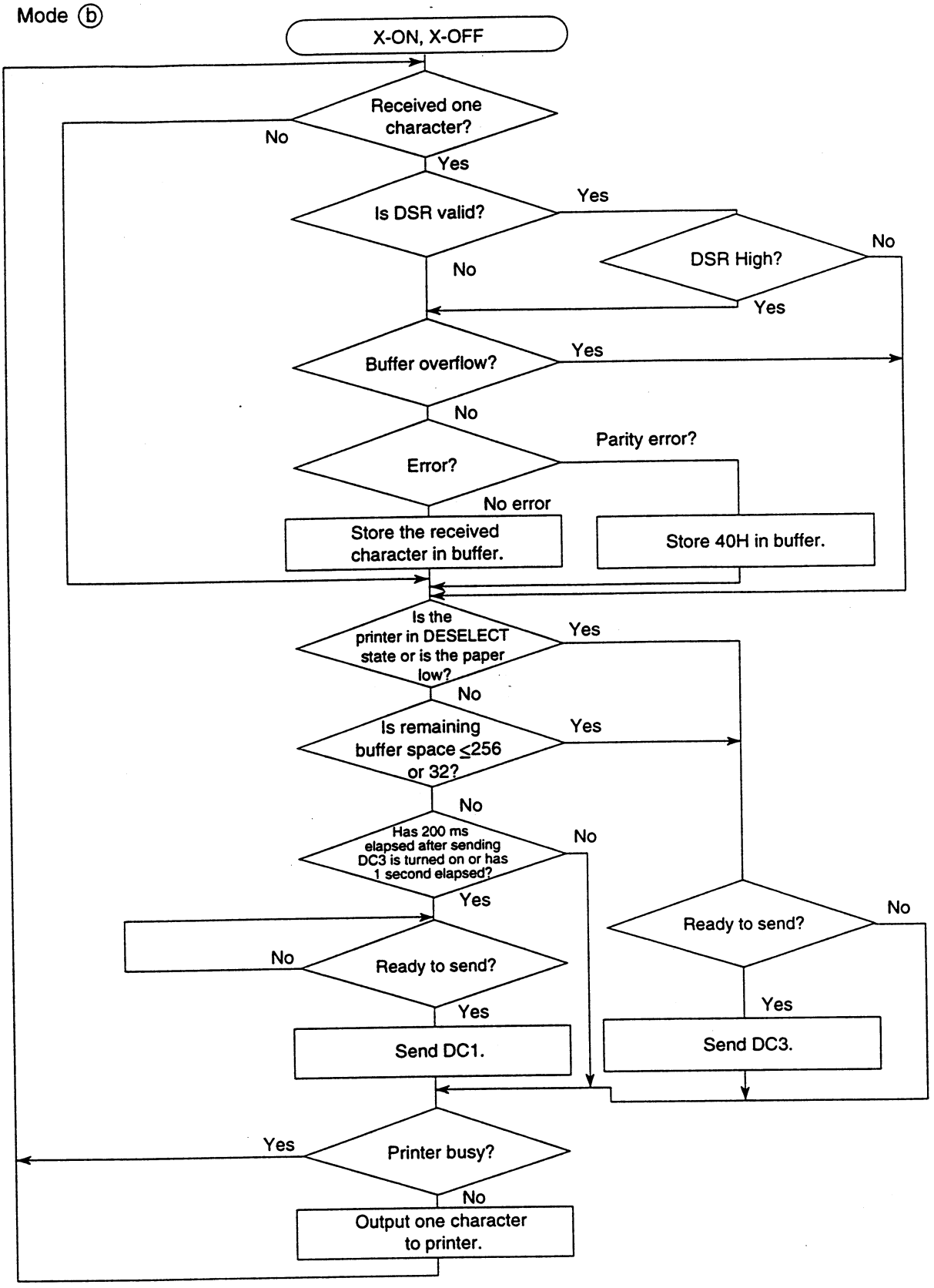


Figure E-3

3. TROUBLESHOOTING FLOWCHART

3.1 Before Repairing a Fault

If possible, ask and record under what condition the problem occurred.

Before troubleshooting, set up the printer to operate under the same conditions as those at the time of the problem occurrence to see if the same problem occurs again. If not, perform the self-test and thoroughly test the printer's functions.

3.2 Troubleshooting

(1) Data cannot be received through the serial interface.

(2) In serial interface reception, some print data is skipped or the printer does not operate.

① Data cannot be received through the serial interface (Protocol is READY/BUSY state, BUSY LINE is SSD +).

- Is the waveform of OSC as shown in Figure E-3-1?

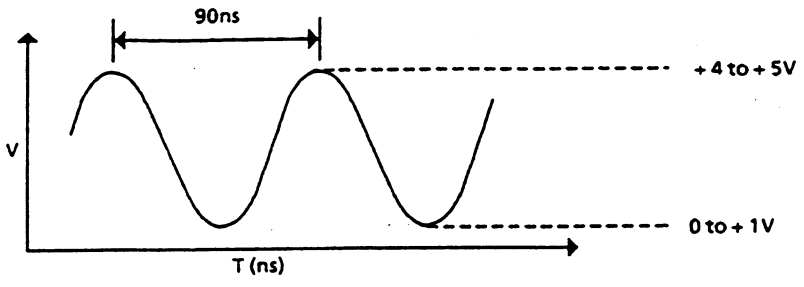


Figure E-3-1

- No Replace OSC.

- Yes Is RST signal of Q3 same as the one shown in Figure E-3-2?

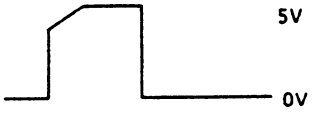


Figure E-3-2

- No Check RST circuit on SHPQ board.

Ⓐ

Ⓐ

Yes — Are ALE, $\overline{PSEN}$, $\overline{RD}$, $\overline{WR}$, and BUS signals of Q3 same as those shown in Figure E-3-3?

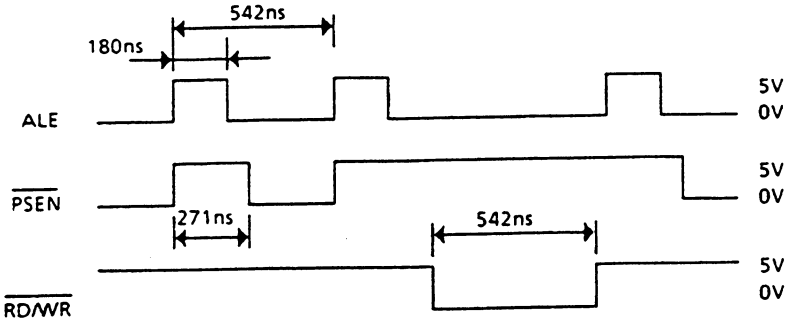


Figure E-3-3

- No — Replace Q3.

Yes — Are the levels of $\overline{SELECT}$ and $\overline{BUSY}$ signals low?

- No — Check 04B on SHPQ board

Yes — Are +9V and –9V output?

- No — Replace components of the ±9V control circuit.

Yes — Is the level of SSD signal at pin 1 in Q3 high?

- No — Replace Q3.

Yes — Is the level of SSD at pin 11 in Q1 low?

- No — Replace Q1.

Yes — Is RxD in Q3 same as the one shown in Figure E-3-4?

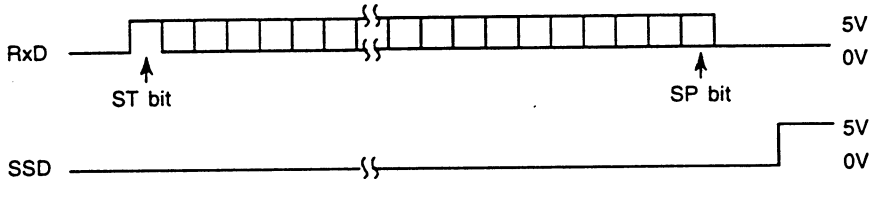


Figure E-3-4

- No — Replace Q2.

Yes — Replace Q3.

② During serial interface reception, some print data is being skipped or the printer does not operate.

- Are RxD and SSD in Q3 as shown in Figure E-3-4?
  - No Replace Q2.
  - Yes Are $\overline{WR}$ and BUS signals at Pin 3 in Q3 same as those shown in Figure E-3-5?

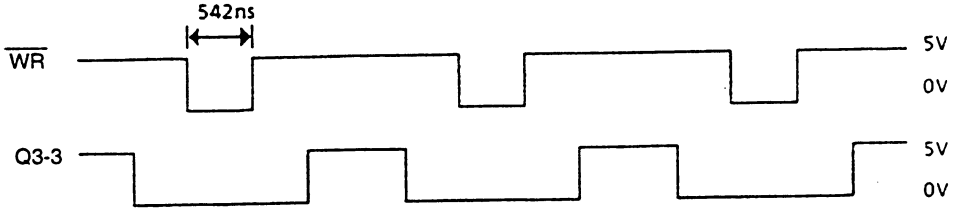


Figure E-3-5

  - No Replace Q3
  - Yes Are the levels of Bus and DB0-7 signals at Q3 same at $\overline{WR}$ signal rise time?
    - No Replace Q7.
    - Yes Is the signal at Pin 4 of Q6 same as $\overline{WR}$ signal in Figure E-3-5?
      - No Replace Q6.
      - Yes Check 04B on SHPQ board.

3.3 Local Test

3.3.1 Circuit test mode

3.3.1.1 Setting

(1) Diagnostic test set by menu. Change Diagnostic test to "YES".

(2) Test connector

Plug the test connector shown in Figure E-3-6 into the serial interface connector.

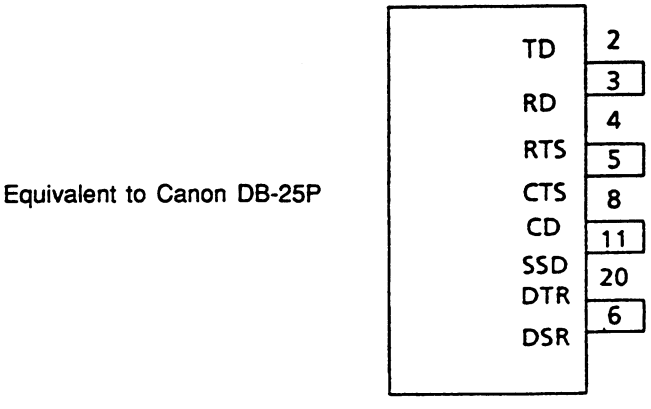


Figure E-3-6 Test connector diagram

3.3.1.2 Function

After completing the settings outlined in Section 3.3.1.1, turn the power on. The serial interface checks the message buffer memory and interface driver/receiver circuits. It then prints selected characters.

To start and stop this test, push the SEL switch on the front of the printer.

Details of this test are explained on the next page.

(1) Prints the serial program revision.

(2) Prints "LOOP TEST".

(3) Checks memory for message buffer.

(4) Prints "GOOD" if the result of memory check is OK or "BAD" if the result of memory check is not OK.

(5) Outputs Low to DTR, RTS, and SSD signals. If one of the DSR, CTS, or CD signals is High, it prints "I/F BAD". If the DSR, CTS, and CD signals are all Low, it prints "I/F=GOOD".

(6) Outputs High to DTR, RTS, and SSD signals. If one of the DSR, CTS, or CD signals is Low, prints "I/F BAD". If the DSR, CTS, and CD signals are all High, prints "I/F=GOOD".

(7) Transmits characters from code 20H to 7FH by SD signals. At the same time, characters are received from the RD signal and stored in the message buffer.

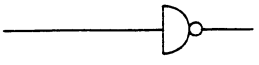
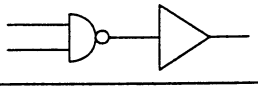
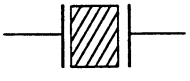
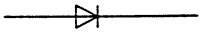
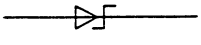
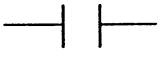
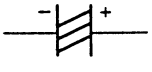
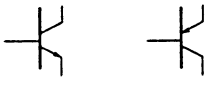
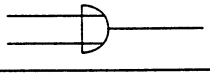
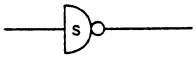
(8) Prints the characters that were stored in the message buffer as indicated in (7).

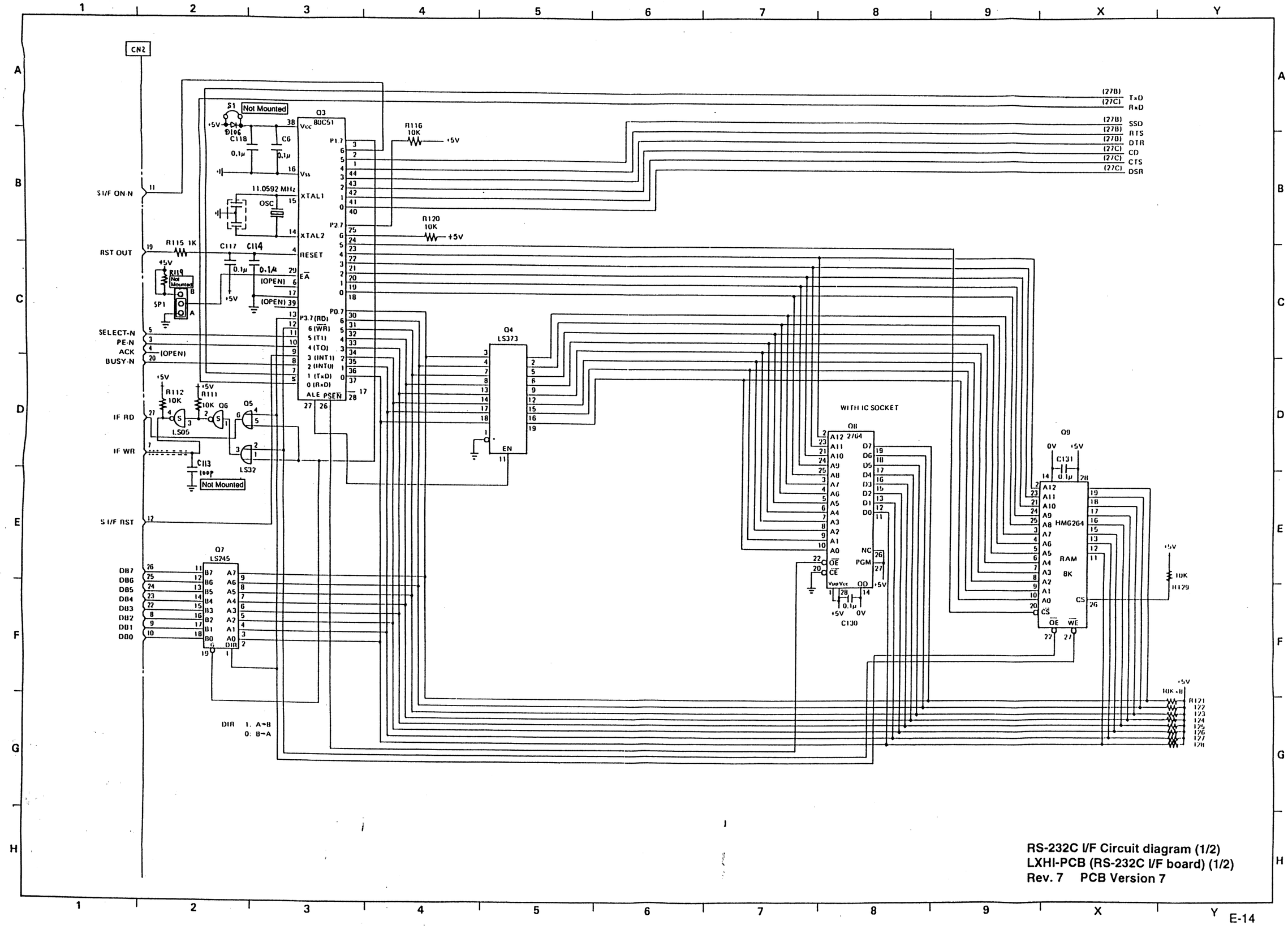
(9) Steps (1) through (8) are repeated until the test selection is deselected or the printer is turned off.

4. CIRCUIT SYMBOLS AND CIRCUIT DIAGRAMS

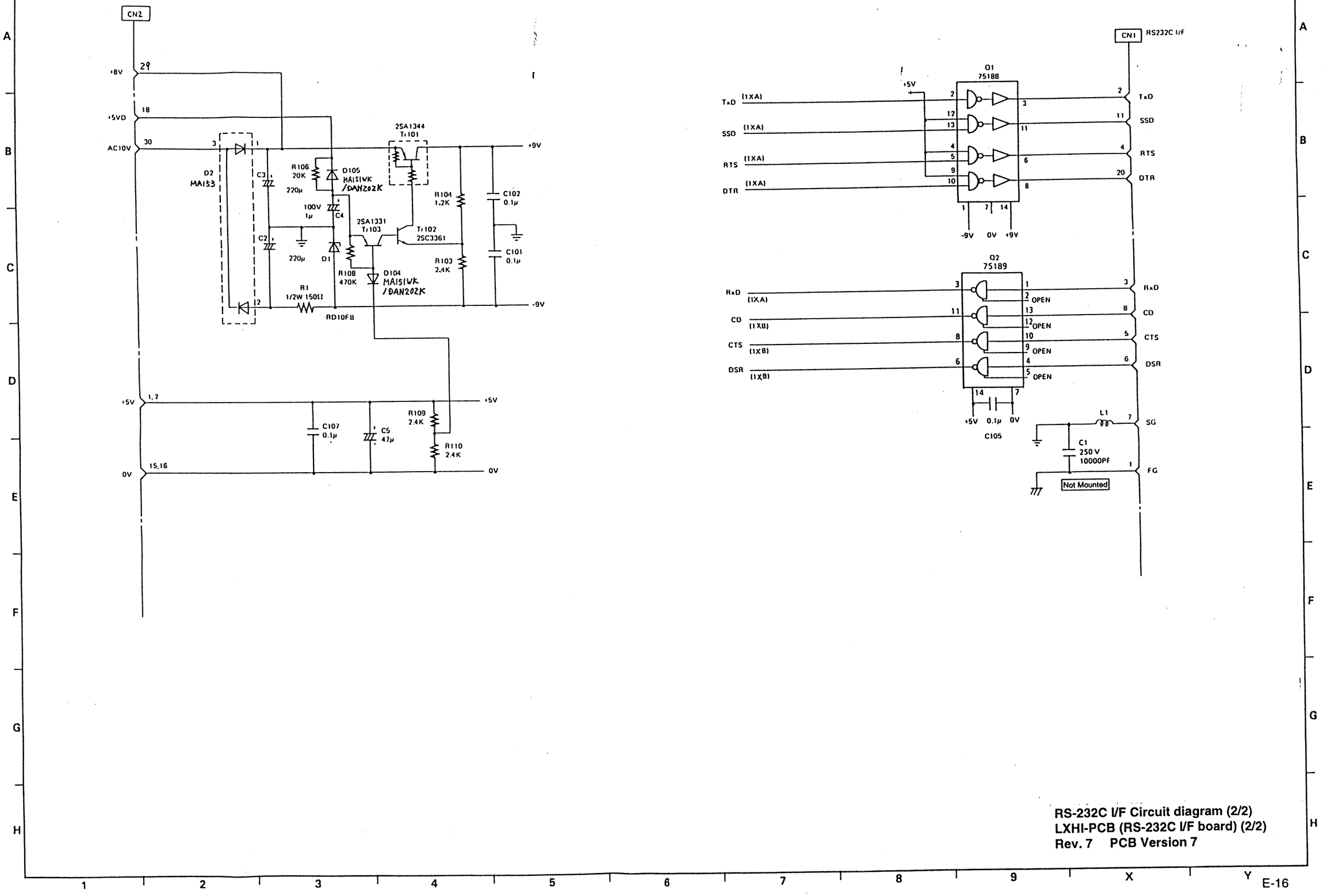
Table E-4-1 lists the circuit symbols used in the super-speed RS-232C interface circuit diagram. Pages E-14 through E-16 are circuit diagrams.

Table E-4-1 Table of symbols

Symbol	Mark	Details
	Q	SN75189 line receiver
	Q	HD75188 line driver
	OSC	Oscillator
	D	Diode
	D	Zener diode
	C	Capacitor
	C	Electolytic capacitor
	R	Resistor
	Tr	Transistor
	Q	MB74LS32 2OR
	S	Jumper wire
	Q	74LS05



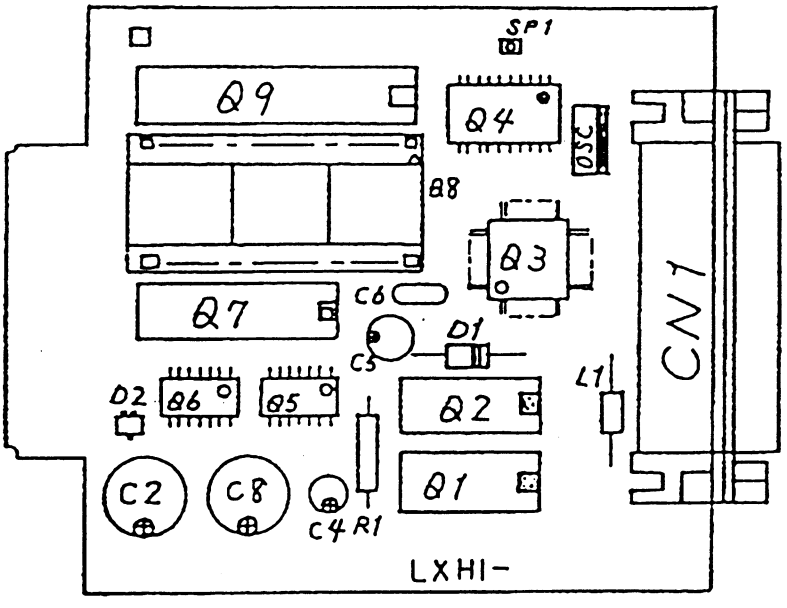
RS-232C I/F Circuit diagram (1/2)
LXHI-PCB (RS-232C I/F board) (1/2)
Rev. 7 PCB Version 7



RS-232C I/F Circuit diagram (2/2)
LXHI-PCB (RS-232C I/F board) (2/2)
Rev. 7 PCB Version 7

5. PCB LAYOUT

(1) LXHI-PCB (RS-232C I/F board)



LXHI-PCB (RS-232C I/F board)
Rev. 7 PCB Version 7

Oki Systems (Danmark) a.s.

Park Alle 382
DK-2625 Vallensbæk
Denmark
Tel : 45 (0) 436 66500
Fax : 45 (0) 436 66590

Oki System (España) S.A.

C/ Goya 9
28001 Madrid
Spain
Tel : 34 (0) 1 5777336
Fax : 34 (0) 1 5762420

Oki Systems (Holland) b.v.

Kruisweg 765
Postbus 690
NL-2132 NG (2130AR)
Hoofddorp
The Netherlands
Tel : 31 (0) 20 6531531
Fax : 31 (0) 20 6531301

Oki Systems (Italia) S.p.A.

Centro Commerciale "Il Girasole"
Pat. Cellini-Lotto 3. 05/B
20084 Lacchiarella (Milano)
Italy
Tel : 39 (0) 2 900 261
Fax : 39 (0) 2 900 7549

Oki Systems (Sweden) AB

Box 131
S-163 55 Spånga
Stormbyvägen 2-4
Sweden
Tel : 46 (0) 8 7955880
Fax : 46 (0) 8 7956527

Oki Systems (Deutschland) GmbH

Hansaallee 187
40549 Düsseldorf 11
Germany
Tel : 49 (0) 211 5266-0
Fax : 49 (0) 211 593345

Oki Systemès (France) S.A.

44-50 Av. du Général de Gaulle
94240 L'Haÿ-Les-Roses
Paris
France
Tél : 33 (0) 146 158000
Fax : 33 (0) 141 240040

Oki Systems (Ireland) Ltd

The Square Industrial Complex
Tallaght
Dublin 12
Ireland
Tel : 353 (0) 1 459 8666
Fax : 353 (0) 1 459 8840

Oki Systems (Norway) A/S

Hvamsvingen 9
P.O. Box 174
N-2013 Skjetten
Norway
Tel : 47 (0) 638 93600
Fax : 47 (0) 638 93601

Oki Systems (UK) Ltd

550 Dundee Road
Slough
Berkshire SL1 4JY
United Kingdom
Tel : 44 (1) 1753 819819
Fax : 44 (1) 1753 819899

Oki Europe Ltd

Branch Office
International Business Centre
Pobrezni 3
186 00 Praha 8
The Czech Republic
Tel : 42 (0) 2 232 6641
Fax : 42 (0) 2 232 6621

Oki Europe Ltd

Branch Office
ul Grzybowska 80-82
PL-00840 Warsaw
Poland
Tel : 42 (0) 2 6615407
Fax : 42 (0) 2 6615451

Oki Europe Ltd

Europa Center
Károly (Tanács) krt. 11. 5A
H-1075 Budapest
Hungary
Tel : 36 (0) 1 2697873
Fax : 36 (0) 1 2697872

Oki Europe Ltd
Central House
Balfour Road
Hounslow
Middlesex TW3 1HY
United Kingdom
Tel : 44 (0) 181 577 9000
Fax : 44 (0) 181 572 7444

OKI

Oki Data Corporation

4-11-22 Shibaura, Minato-ku,
Tokyo 108, Japan
Tel: (03) 5445-6162 Fax: (03) 5445-6189

M-521251-2A 1-95 Printed in Japan